DOCUMENT RESUME

ED 409 001 IR 018 415

AUTHOR	Maushak, Nancy J., Ed.; And Others
TITLE	Encyclopedia of Distance Education Research in Iowa. Second Edition.
INSTITUTION	Iowa Distance Education Alliance, Ames.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	Jun 97
NOTE	249p.; For the first edition, see ED 388 314.
CONTRACT	R203F50001-95
PUB TYPE	Information Analyses (070) -- Reference Materials - General (130) -- Reports - Research (143)
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	*Computer Assisted Instruction; *Computer Mediated Communication; *Distance Education; Educational Needs; *Educational Research; Elementary Secondary Education; Higher Education; Instructional Innovation; Professional Development; Secondary Education; Student Attitudes; Teacher Attitudes; Teacher Education; Teaching Methods
IDENTIFIERS	*Iowa

ABSTRACT

This document is a resource for distance education research in Iowa, including information on developing, implementing, and administering distance education systems. This second edition contains the original 16 research papers published previously, as well as 8 additional, more recent research studies. The first section describes distance education in Iowa, the Iowa Communications Network (ICN), the Iowa Distance Education Alliance, and the research plan. The second section contains the research articles, divided according to the following headings: (1) "Adoption of an Innovation"; (2) "K-12 Teacher Attitudes Toward Distance Education"; (3) "The K-12 Distance Education Experience"; and (4) "Distance Education in Postsecondary Institutions." Research article topics include: use of the ICN; teachers' training; teacher attitudes; assessment of program implementation, learning needs and course performance; teacher attitudes and change; telecommunications-assisted instruction in family/consumer sciences, music, HIV/AIDS education, and foreign language; constructivist-based distance education environments; ICN use for secondary agriculture and music instruction; instructional adoption of the Internet; cooperative learning with interactive multimedia; teacher and student perceptions of effective instructional methods; virtual field experience; demographics and innovation of the community college; and adult education. The third section, "Literature Review," includes the definition, history and theory of distance education; a review of the literature; a discussion of operational issues; and a science bibliography. (AEF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 409 001

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Encyclopedia of Distance Education Research in Iowa

2nd Edition - revised June 1997

IDEA

IR018415

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Michael Simonson
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

DE Cover

5/29/97, 9:38 AM

PANTONE 329 CVC

BEST COPY AVAILABLE

IDEA

Encyclopedia of Distance Education Research in Iowa

2nd Edition revised June 1997

Editors:
Nancy J. Maushak
Michael Simonson
Kristen Egeland Wright

A publication of the Teacher Education Alliance of the Iowa Distance Education Alliance, Iowa's Star Schools Project. This project was funded in part by U.S. Department of Education Star Schools Grant #R203 F 5000 1-95

TREG
Technology Research and Evaluation Group

Technology Research and Evaluation Group
E006 Lagomarcino Hall, College of Education
Iowa State University, Ames, IA 50011
(515) 294-6919 Fax: (515) 294-9284

The Editors

The editors are all involved in the Research and Evaluation component of the Iowa Distance Education Alliance (IDEA), Iowa's Star Schools project. They may be contacted at the Technology Research and Evaluation Group, E006 Lagomarcino Hall, Iowa State University, Ames, Iowa 50011. Telephone (515) 294-6919. Fax (515) 294-9284.

Nancy J. Maushak is a program coordinator and research associate at the Technology Research and Evaluation Group at Iowa State University. She has been involved in coordinating the activities of the Teacher Education Alliance (TEA), a subgroup of the IDEA and has been the lead evaluator for a number of funded projects, including Iowa's Star Schools project. She has authored several project and evaluation reports. Ms. Maushak received a Bachelor of Science degree in recreation from the University of South Dakota, a Bachelor's and Master's degree in education from Chadron State College, and is currently a Ph.D. candidate in curriculum and instructional technology at Iowa State University.
(nmaushak@iastate.edu)

Michael R. Simonson is a professor in the Department of Curriculum and Instruction at Iowa State University and the project leader for the Technology Research and Evaluation Group. Dr. Simonson was the coordinator of the TEA. He has conducted research in the areas of computer anxiety and media and persuasion and has authored numerous publications, including several textbooks. Dr. Simonson received his Bachelor's and Master's degrees at Iowa State University and his Doctorate at the University of Iowa.
(mrs@iastate.edu)

Kristen Egeland Wright is a research assistant in the Technology Research and Evaluation Group. She has worked with the coordination and evaluation of several funded projects and has co-authored project and evaluation reports. Ms. Wright received a Bachelor of Fine Arts from Iowa State University and is currently a Ph.D. candidate in curriculum and instructional technology.
(eboe@iastate.edu)

TABLE OF CONTENTS

PREFACE i

SECTION I: INTRODUCTION 1

Simonson, Michael — Overview of the Teacher Education Alliance, Iowa Distance Education Alliance Research Plan 3

SECTION II: RESEARCH ARTICLES 7

Cluster 1: Adoption of an Innovation 9

Omalley Abel and Meredith Hays — Use of the ICN: A Look at High School Principals in Phase III 11

Abou-Dagga, Sanaa and Herring, Mary — Teachers' Training in Distance Education and Their Willingness to Use the Technology After the Completion of Inservice Training 15

Fagan, Patsy J. — Assessment of Distance Education Implementation in Iowa: Concerns and Indicators of Success 23

Merkley, Donna J., Bozik, Mary, and Oakland, Kathy — Investigating Teacher Change Associated with Distance Learning in Education 31

Cluster 2: K-12 Teacher Attitudes Toward Distance Education 43

Bigilaki, Lemonia Torrie, Margaret and Hausafus, Cheryl — Family and Consumer Sciences Secondary School Teachers' Orientations Toward Distance Education Technology for Curriculum Delivery 45

Herring, Mary — Development of Design Guiding Principles for Constructivist-Based Distance Learning Environments 57

Miller, Greg — Usefulness of the Iowa Communications Network for Delivering Instruction in Secondary Agriculture Programs 63

Sereg, Patricia Anne — Educators Adoption of the Internet 69

Simonson, Donald — Applied Vocal Music Instruction on the ICN 73

Torrie, Margaret and Hausafus, Cheryl O. — Utilizing Distance Education to Deliver Secondary School HIV/AIDS Education 79

Torrie, Margaret and Miller, Wade W. — An Assessment of Iowa Secondary Vocational Teachers' Attitudes Toward Using Interactive Distance Education Strategies to Support Competency-Based Curriculum Reform Efforts 85

BEST COPY AVAILABLE

Cluster 3: The K-12 Distance Education Experience 91

Adamson, Jane Mason	Gender and Group Gender Composition as Factors in Interaction Patterns and Attitudes of Students Working Cooperatively with Interactive Multimedia	93
Downs, Dennis A.	Cedar Falls Harp Project: Music Instruction on the Fiber Optic Telecommunications Network	99
Fast, Michael	Assessing the Roles of Participants in Multi-Site, Foreign Language Instruction: Interaction in a Technology-Mediated Environment	103
Schoenfelder, Krista R.	Student Involvement in the Distance Education Classroom: Teacher and Student Perceptions of Effective Instructional Methods	115
Simonson, Donald	The Iowa Communications Network as a Vehicle for the Delivery of Applied Instrumental Music Instruction	123
Tillotson, John W. and Henriques, Laura	Teaching Science at a Distance: The Teacher's Perspective	129

Cluster 4: Distance Education in Postsecondary Institutions 137

Allen, Gayle	Virtual Field Experience Utilizing Computer Networks and Interactive Television	139
Baker, Molly Herman	Distance Teaching with Interactive Television: Strategies that Promote Interaction with Remote-Site Students	143
Doerfert, David L. Miller, Wade W.	Using Diaries to Assess the Learning Needs and Course Performance of Students Served by Three Instructional Delivery Means	153
Rude, Jodi Lynn	Community College Demographics and Innovativeness Toward Distance Education: Is there a Correlation?	163
Sorensen, Christine K.	Attitudes of Community College Student Toward Interactive Television Instruction	167
Taylor, Debra, Torrie, Margaret and Hausafus, Cheryl	An Assessment of Family and Consumer Science Educators' Knowledge, Interest and Attitude Toward Adult Education Delivery via the Iowa Communications Network	185
Westbrook, Thoimas S.	A Longitudinal Profile of the Content Learning and the Attitudes of Adults Enrolled in a Graduate Degree Program Utilizing The Iowa Communications Network	191

SECTION III: LITERATURE REVIEW 199

Hanson, Dan	Distance Education: Definition, History, Status and Theory	201
Maushak, Nancy	Distance Education: A Review of the Literature	221
Sorenson, Christine K.	Distance Education: Operational Issues	235
	Distance Education: A Selected Bibliography	246

Preface

The first edition of the Encyclopedia of Distance Education Research in Iowa was published in 1994. A revised edition was completed in 1995. Since then, over 1000 copies of the Encyclopedia have been distributed to educators, administrators, and policy-makers in the United States and a number of other countries.

Because of the success of the Encyclopedia, a second edition was begun during 1996. This edition contains the original sixteen research papers published previously. It also contains an additional eight research studies which were recently completed. Because of the rapid changes in the theory and practice of distance education, the Literature Review section of the original Encyclopedia was significantly revised and expanded with the addition of a large section dealing with research. It now summarizes and provides an overview of the growing body of literature related to distance education.

This Encyclopedia is designed for use by those responsible for developing, implementing, and administering distance education systems. Also, it is a tool for researchers who are investigating issues related to distance education. It is hoped that the studies and reviews contained in the Encyclopedia will serve as a foundation for additional research in this important area.

Many individuals and organizations contributed to this publication. Fundamental to the development and publication of this edition of the Encyclopedia were the efforts of the Technology Research and Evaluation Group of the Department of Curriculum and Instruction at Iowa State University. This group coordinated the process of writing, editing, formatting, and publishing the Encyclopedia. Certainly the individual researchers who contributed the articles contained within this document are to be commended, also.

Finally, it is important to acknowledge the U.S. Department of Education's Star Schools Program which provided funding for the Encyclopedia's publication and distribution. It is anticipated that a third edition will be published in 1998.

Michael Simonson
Professor, and
Project Leader
Technology Research and Evaluation Group
1997

Section I:

Introduction

Overview of the Teacher Education Alliance, Iowa Distance Education Alliance Research Plan

Michael Simonson
Iowa State University

Introduction

Two significant events have occurred in Iowa. First, the Iowa Communications Network (ICN), a statewide, full-motion interactive fiber optic network, is in use. The ICN is a 2800 mile system that connects sites in each of Iowa's 99 counties with a fiber optic network for distance education. The ICN is being built entirely with state funds and is designed to enhance the educational opportunities available to students in Iowa's schools.

Second, a group of Iowa educational organizations prepared a proposal titled the Iowa Distance Education Alliance (IDEA), and in October 1992 received notification of funding from the U. S. Department of Education's Star Schools Program. The IDEA's primary purpose was to infuse distance education into the schools and colleges of Iowa.

Few innovations have the potential impact that the ICN may have on Iowa education. The goal of the IDEA research plan was to empirically examine the infusion of the innovation, "a statewide full-motion interactive fiber optic network," and provide information about the large scale adoption of distance education by an entire state.

This article describes distance education in Iowa, the ICN, the IDEA, and the IDEA research plan. Research and evaluation are central to the implementation of distance education in Iowa. The process used to rally educators to conduct research is explained.

Distance Education in Iowa: Background

Iowa's approach to distance education is based on the belief that live, interactive instruction is fundamental to effective learning. Interaction is made possible by the ICN. The ICN is a statewide two-way full-motion interactive fiber optic telecommunications network. It is designed to be used by teachers and students in learning situations where they can see and hear each other. Distant and local students function together as a learning group. They learn from and with one another.

Key to Iowa's successful distance education system is the concept of sharing. Iowa's vision for distance education is being built around the development of partnerships of schools that share courses. For example, a physics class originating in Jefferson may have students in Sac City and Rockwell City, schools in two adjacent counties. All three schools can provide courses to partner schools and receive instruction from neighbors. Classes are small, with enrollments of 30-35 or less, and are taught by teachers prepared in the skills needed by distance educators.

The United States has been perceived as having the finest education system ever developed. Local control, small classes, rapport between teachers and students, and highly personalized instruction are hailed as important characteristics of this respected system. On the other hand, telecommunications-based education is often perceived as the antithesis to these attributes. Distance education and telecommunications create the image of a centralized curriculum, a single source of information, and large classes with little or no interaction between the teacher and students. Some feel that the traditional values of education and increased use of technology are incompatible. Iowa educators are attempting to prove these critics wrong.

Of the many projects of the last few years that have promoted the use of technology, few have been as successful as the U.S. Department of Education's Star Schools Program. The Star Schools Program began in 1987 "to encourage improved instruction in mathematics, science, foreign languages, literacy skills, and vocational education for underserved populations through the use of telecommunications networks." Many Star Schools projects have used communications satellites to deliver courses to large numbers of students located in dozens of cities and states. In 1992, a new approach to distance education was recognized by the Star Schools Program when a proposal submitted by an alliance of educational organizations in the state of Iowa was funded. Since 1992, the Star Schools Program has funded the Iowa Distance Education Alliance four out of five years.

Iowa's project demonstrates a distance education system that uses a statewide two-way full-motion interactive fiber optic telecommunications network. The "Iowa Distance Education Alliance: Partnerships for Interactive Learning Through Telecommunications (IDEA)," Iowa's Star Schools project, demonstrates that historically important characteristics of an effective educational environment can be combined with educational technology to bring the best of both to the student faced with the challenge of being a citizen of the 21st century. The use of fiber optic technology, because of its extensive capacities and flexibility, provides unique opportunities for augmenting the instructional process beyond what is possible using other distance delivery technologies. The IDEA demonstrates the use of a system that emphasizes:

- local control of the curriculum,
- active involvement by educators from local school districts,
- interactive instruction,
- statewide alliances and regional partnerships,
- preservice, inservice, and staff development activities,
- implementation using existing organizations and expertise, and
- research-based instructional decision making.

During the development of the research plan of the IDEA, it became obvious that Iowans were, in Rogers' (1983) terms, reinventing distance education. Thus, a tentative definition of the theoretical approach for the study of distance education emerged and was used to guide both the study and practice of distance education in Iowa. Distance education was defined as formal, institutionally-based educational activities where the teacher and learner are normally separated from each other in location but not normally separated in time, and where two-way, full-motion interactive telecommunications systems are used to connect them for the sharing of video, data, and voice-based instruction.

Iowa researchers went on to propose a theoretical approach for the practice of distance education.

> The more similar the learning experience of the distant student is to that of the local student, the more similar will be the outcomes of the learning experience.

The Iowa Communications Network (ICN)

Central to the successful completion of the IDEA project was the ICN. The ICN is a statewide two-way full-motion interactive fiber-optic telecommunications network with at least one point of presence in each of Iowa's 99 counties. The ICN links colleges, universities, and secondary schools throughout the state and was constructed entirely with state and local funds.

The plan for the ICN was completed and adopted by the Iowa legislature in 1987. Construction of the fiber optic backbone portion of the network was completed during 1993. The ICN will ultimately connect hundreds of schools, colleges, regional libraries, and governmental agencies. In addition to the capability of transmitting up to 48 simultaneous video channels, the ICN carries data and voice traffic, and as demand increases the system is easily expandable without the need for "opening the trench" to lay more fiber. The role of the IDEA Star Schools initiative was to develop and enhance the human and technical resources necessary to make effective use of the ICN. By 1997, over 400 classrooms had been connected to the ICN.

The Iowa Distance Education Alliance

Partnerships of Iowa educational organizations implemented the goals and objectives of the IDEA. These partnerships were also referred to as alliances because they were a "joining for a common purpose," which was the appropriate infusion of live, two-way interactive telecommunications into the educational systems of the state of Iowa.

The IDEA was formed as the result of a collaborative effort of teachers and administrators from local school districts, the Iowa Department of Education, Iowa Public Television (IPTV), Iowa's community colleges, area education agencies, and public (regent) and independent colleges and universities, with support from teacher and administrator professional organizations and the state's K-12 school boards. This alliance of Iowa's educational organizations was also responsible for completing the IDEA project.

Educational organizations participating in the IDEA were organized into several components to ensure that the activities of the project were completed. First, 15 regional partnerships, organized in accordance with Iowa's merged area education structure, were formed. The state's 15 area community colleges and 15 area education agencies which share common boundaries collaborated with teachers and administrators from local schools to plan for staff development, inservice activities, and course offerings. Classrooms were equipped. Teachers were trained. Curriculum materials were developed. Staff inservice activities were offered, and courses have been shared.

Second, a clearinghouse, the Iowa Database, was established by the Iowa Department of Education. The clearinghouse provides quick and comprehensive access to information about interactive telecommunications and coordinates access to other telecommunications networks, such as the Internet.

The third component of the project was the Teacher Education Alliance which was coordinated by faculty from each of the state's three public universities. The Teacher Education Alliance developed preservice and inservice teacher education experiences. Materials were used to assist teachers in curriculum revision activities and to prepare them for instruction of students at a distance. Workshops and institutes were held and curriculum plans for staff development were made available. Finally, the staff of the Teacher Education Alliance developed and completed a comprehensive plan for research and evaluation to determine the unique contributions of the Iowa approach to the theory and practice of distance education.

The fourth component of the IDEA was the project management structure which was coordinated by IPTV and the Iowa Department of Education. The project manager's primary responsibilities were to administer the activities of the project and to interact for the alliance with organizations in Iowa and elsewhere.

The Research Situation

Feelings in Iowa related to distance education have traditionally been volatile, and this presented the opportunity for many research studies. Specifically, the situation in Iowa during the IDEA project was characterized by the following.

- The ICN was planned for the educational community of Iowa by state government, most notably by the administrative branch. No consensus was sought from or given by Iowa's educators. In other words, the ICN is a top-down innovation that was built and now is available to Iowa educators.

- In 1993 when the project began, only a small percentage of Iowa educators and Iowa citizens clearly understood distance education and the ICN, but most were aware that the state was spending hundreds of millions of dollars to construct the ICN.

- Many educators and citizens were skeptical of the concept of distance education and opposed the construction of the ICN.

- Fiber optic communication was determined to be the most effective transmission method for live two-way full-motion interactive telecommunication, even though it is not the only effective transmission method, or the most cost effective transmission method. In Iowa, fiber optics was mandated by the legislature as the primary medium for distance education.

- Most teachers were not familiar with the techniques of the distant educator or the needs of the distant learner.

The Research Plan - Beginnings

Distance education research is emerging, is largely anecdotal, is not empirically based, and usually is reported as individual studies with little or no relationship to an ongoing, large-scale research plan. However, theories of distance education have been proposed and are beginning to gain acceptance. Rogers' Diffusion of Innovations Theory (Rogers, 1983), one of several theories that provide a foundation for research in distance education, was considered by the IDEA to be an appropriate guide for a large-scale research agenda focused on the diffusion of distance education in Iowa.

Several steps were followed in the development of an IDEA research plan. First, a group of Iowa educators was identified to serve as a research and evaluation advisory panel (REAP). This group developed the plan for soliciting research proposals from those interested in investigating the distance education situation in Iowa. A Request for Proposals (RFP) was issued to more than 1000 Iowa educators from a cross section of academic disciplines and organizations. The RFP process was conducted in four phases. After each phase, proposals were reviewed by the REAP who provided authors of the proposals with suggestions for improving their studies. In some cases, proposals were revised and resubmitted based on suggestions made by the REAP. At the conclusion of the RFP process, studies were selected for funding.

Next, a comprehensive review of the distance education literature was commissioned. This monograph (Schlosser and Anderson, 1994), published by the Association for Educational Communications and Technology, included current information on the theories, research, and critical issues of distance education. It was distributed to the researchers whose proposals were selected for funding to assist them in their research efforts.

Late in 1993, the RFP process was concluded. Next, summaries of the funded research studies were published, informing Iowa educators of the project's research plan. Fi-

BEST COPY AVAILABLE

nally, the first edition of the Encyclopedia of Distance Education Research in Iowa was published.

The Research Plan - Part 2

In 1995, the research plan was continued when a new request for proposals was published. Eight studies were selected for funding and completed as a result of this proceess. Those studies are included as part of the second edition of the Encyclopedia. Because of the rapid changes in the theory and practice of distance education, the monograph, Distance Education: A review of the Literature, was revised and expanded in 1996. This monograph, in its intirety, is included as part of the second edition of the Encyclopedia.

It is anticipated that the RFP process will continue for at least one more year, and new studies will be published in the 3rd edition of the Encyclopedia.

Conclusion

> Finally, the most fundamental and most important characteristic of a profession is that the skills involved are founded upon a body of intellectual theory and research. Furthermore, this systematic theory is constantly being expanded by research and thinking within the profession . . . the practice of a profession cannot be disjoined from its theoretical understanding and vice versa . . . The antithesis to a profession is an avocation based upon customary activities and modified by the trial and error of individual practice. Such an avocation is a craft. . . The difference between the bricklayer and the architect lies right here. (Finn, 1953, p. 9.)

In Iowa, every attempt is being made to insure that the practice of distance education is based on theory supported by research.The results of the research plan described above will support the professionalization of distance education in Iowa and nationwide.

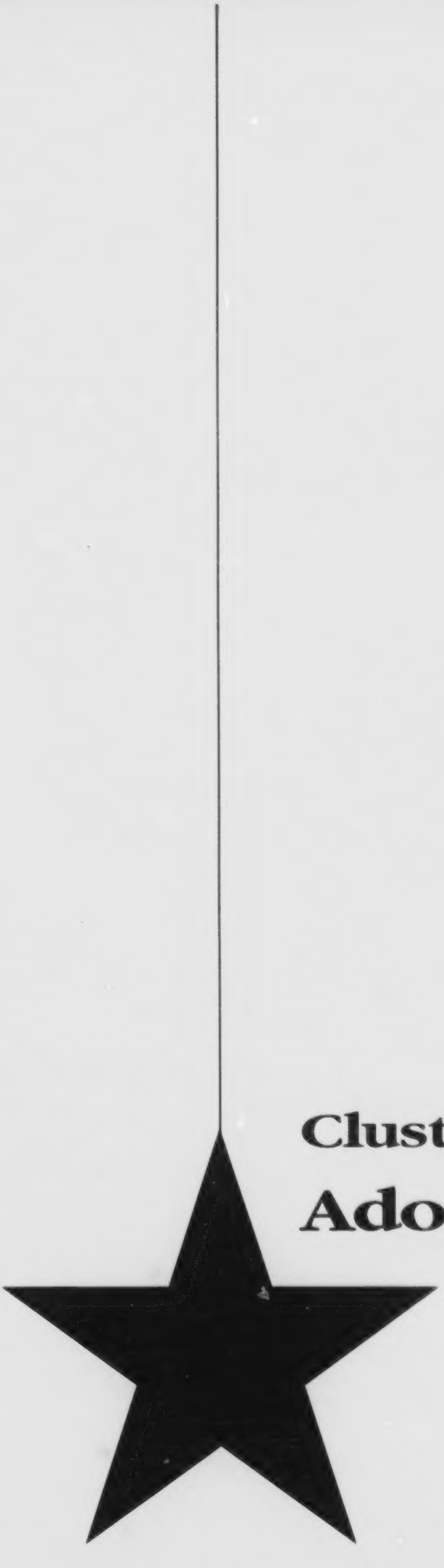
References

Finn, J. (1953). Professionalizing the audiovisual field. Audio-Visual Communications Review, 1(1), 6-17.

Rogers, E. M. (1983). Diffusion of innovations. New York: The Free Press.

Schlosser, C. & Anderson, M. (1994). Distance education: Review of the literature. Washington, D.C.: Association for Educational Communications and Technology.

Section II:
Research Articles



Cluster 1:

Adoption of an Innovation

Use of the ICN:
A Look at High School Principals in Phase III

Omalley Abel
Meredith Hays
Iowa State University

Introduction

Distance education is an evolving and ever-growing field in today's high technology world. Iowa's two-way, live, interactive fiber optic network is a model of distance education. However, little is yet known about the organizations (high schools) which are connecting to and using the Iowa Communications Network (ICN)

Many educational authorities acknowledge that changes in education are necessary, but recognize that schools are mainly conservative and traditional, slow to respond to new innovations (Carr, 1985). Distance education, a relatively new innovation in Iowa, has the potential to deliver quality instruction statewide. However, based on Carr's statement, many schools will be reluctant to accept distance education.

Given that most educators believe that distance education will become more prominent over time, it is of more than passing interest to study the process of organizational change and the factors that facilitate or impede the acceptance of a new innovation (U.S. Congress, Office of Technology Assessment, 1989).

Rogers (1983) identifies four variables which have an effect on the rate of adoption of innovations: perceived relative advantage of the innovation; the perceived compatibility of the innovation with the existing values; the perceived complexity, and; trialability of the innovation. However, many possible factors can influence the acceptance of distance education, such as school leadership. It is important to examine what leadership factors in secondary schools influence whether or not an innovation is accepted.

According to The Best Schools: Blueprints for Excellence (1994), "Leadership is the most important role of the principal. In case after case, it has been demonstrated that it was the principal who has made the most significant difference in the transformation of a school...." If this is true, then it is the principal who sets the tone and mood of the school. This would also seem to hold true for attitudes towards and about distance education and affect use of the ICN.

Purpose and Objectives

This study proposes to examine the relationship between the principal, as leader of his/her school, and the school's use of the ICN. The researchers want to determine what relationship exists between principal innovativeness and the school's usage data. To accomplish this, a survey was used to measure individual innovativeness of each principal and his/her perceptions of their school's innovativeness. In addition, information was gathered from ICN Request Sheets from Iowa Public Television.

The objectives of this study were to 1) look at principal innovativeness of individual high schools as the ICN grows in the state, 2) look at principal perceptions of their school's innovativeness, and 3) advance the knowledge base of adoption of distance education systems. The study focused on the relationship between the first two objectives and the usage data of each school.

Methodology

Subjects

The subjects for this study were high school principals. Seventy-three high schools were connected to the ICN as of April 1996. Surveys were sent to the principals of each of the connected schools. Of the 73 surveys sent out, 64 were returned, providing the researchers with an 88% response rate.

Instruments

Data for this study was collected using a survey developed by the researchers. The instrument was based on a Lickert-type scale. The first section asked respondents to rate their organizations behavior and their personal behavior towards technology. Items in this section were rated on a seven point scale with "1" representing "strongly disagree" and "7" representing "strongly agree".

From the first section of the survey the level of innovativeness for individuals and the organization was determined. Organizational innovativeness had a mean of 50.5, while individual innovativeness had a mean of 53.4.

The demographic section requested gender and years of experience as a principal. The latter item provided for "less than five years" to "twenty five years or over" of experience. Respondents also rated their knowledge, personal involvement, and their school's involvement in distance education. Items in this section used a five point Lickert-type scale, with 1 representing "none" and 5 representing "extensive".

ICN Request Sheets from Iowa Public Television were used to collect usage data on each school. This data included the number of times the school's facilities were utilized as an origination site and number times the school participated as a remote site.

Procedures and Analysis of Data

The survey instrument was mailed to each principal identified as having a school with an operational ICN site. A second survey was sent to those principals who did not respond within a month. The total return rate was 88%. Usage data for May, 1996 was collected from Iowa Public Television. Results were analyzed using the statistical package for Social Sciences (SPSS). Statistics computed were descriptive statistics and the Pearson product-moment correlation.

Results

Demographic Characteristics

The population of respondents were 3.1% female and 96.9% male. Of those, 15.6% had less than five years of experience as a principal, 25.0% had 5-9 years experience, 23.4% had 10-14 years experience, 14.1% had 15-19 years experience, 9.4% had 20-24 years experience, and 12.5% had 25 years or more experience.

Of the 64 respondent schools, only 27 had served at an origination site in May, 1996. All but six of the schools had served as a remote at least once. Fifty-three percent of the respondent sites had served as a remote five or more times.

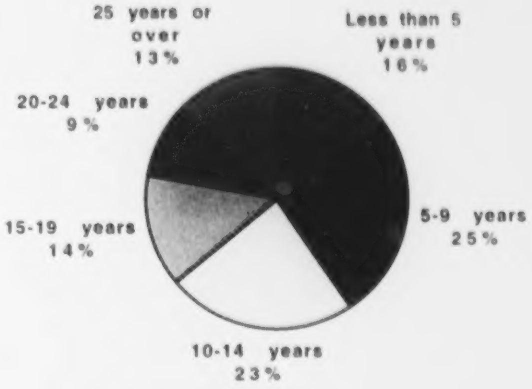


Figure 1. Years of Experience as a Principal

Statistical Results

Pearson product-moment correlation showed no significant results when the principal's innovativeness was run with the usage data on the number of times served as originator and the number of times served as a remote. Additionally, no significant results were shown when the same variables were run with the principal's perceptions of his/her school's innovativeness.

Conclusions

Survey composite means seemed to indicate a positive attitude towards innovations. Participants in this study were knowledgeable of distance education and felt that personally and organizationally, they were innovative. There were no correlations found between the number of times a school participated as an origination site or as a remote site and the perceived level of organizational innovativeness. One limitation, which may have contributed to the results of this study, was the length of time schools had been connected to the ICN when the survey was distributed. Some schools had only been connected to the ICN for less than one month, which may have resulted in the school having low participation numbers.

Another limitation of this study was that the number of times a school served as an origination site did not accurately reflect the actual number of times they broadcast. An indication of "1" on the ICN Request Sheet could have represented a one-time meeting, or it could have been a three day a week, semester long class. For this reason, future studies should look at how schools are using their ICNs.

BEST COPY AVAILABLE

One final limitation of this study was that the researchers collected ICN usage data for only one month. This may not have been the best representation for ICN use by a school. Looking at an ICN site over the course of a year might produce different results.

Finally, while correlations between perceived organizational innovativeness, individual innovativeness, and use of the ICN were not found, most principals felt themselves and their organizations to be innovative. This reflects positively on Iowa schools and the use of the ICN as a delivery system for learning. This project was a positive experience for those involved and the subject of the study warrants future research.

References

Carr, G. (1985, December). Characteristics of Florida vocational educators and their receptivity to and attitude toward educational change and innovation. Atlanta, GA: American Vocational Association Convention. (ERIC Document Reproduction Service No. 266 299)

Clark, R. E. (1989, Spring) Evaluating distance learning technology. Washington D. C.: Office of Technology Assessment. (ERIC Document Reproduction Service No. 325 097)

Hanson, D., Maushak N., Schlosser, C., Anderson, M., Sorenson, C., & Simonson, M. (1996). Distance Education: Review of the Literature, 2nd Edition. Ames, Ia: Iowa State University, Research Institute for Studies in Education.

Ogden, E. & Germinario, V. (1994). The Nation's Best Schools: Blueprints for Excellence. Lancaster, Pennsylvania: Technomic Publishing Company.

Rogers, E. M. (1983). Diffusion of Innovations. (3rd ed.) New York: The Free Press.

Rude, J. (1994). Community College demographics and innovativeness toward distance education: Is there a correlation?. Unpublished master's thesis, Iowa State University, Ames, IA.

Sorenson, C., Schlosser, C., Anderson, M., & Simonson, M. (Eds.). 1995. Encyclopedia of Distance Education Research in Iowa. Ames, Ia: Iowa State University, Research Institute for Studies in Education.

U.S. Congress, Offices of Technology Assessment. (1989). Linking for learning: A new course for education. OTA SET-430. Washington, DC: US Government Printing Office.

Teachers' Training in Distance Education and Their Willingness to Use the Technology After the Completion of Inservice Training

Sanaa Abou-Dagga
Mary Herring
Iowa State University

Introduction

Education is changing. A paradigm shift has occurred within education as the world has moved from the industrial age to the information age (Reigeluth, 1994; Toffler, 1990). This shift has provided educators with technological innovations that have created new environments of teaching and learning; environments that no longer support the "assembly line" view of industrialized education. Reigeluth (1994) describes industrialized education as education which treats all students the same; all students are expected to do the same thing at the same time. This sameness forces students to be passive learners and passive members of their school community. Information age education can create environments that see the student as an active participant in the construction of new knowledge. Technology offers an empowering environment for meeting the needs of the students in this new age; an environment that offers a chance for active student-constructed learning and adventurous risk-taking teaching (Dede, 1990; Sheingold, 1990).

Distance education technology offers a robust opportunity for the creation of empowering environments. It is what Zuccermaglio (1993) describes as an "empty or open" rather than a "full" technology. Full technology is designed to transfer information from the machine to the learner, while empty technology offers the opportunity for metacognition and reflection on the learning activity. Distance education as "empty" technology can be used to develop transferable cognitive abilities, not simply more efficient recall of prescribed information. It maximizes communication rather than isolation (Garrison, 1993). Distance learning environments offer opportunities for local and long distance collaboration, increased communication between students and teachers, access to the larger global community, and access to "others'" views of the world (Sheingold, 1990). However, these opportunities will not occur spontaneously. Planning, training, and experience must be provided if the potential of distance education is to be reached.

Teacher Training and Distance Education

Distance education cannot succeed with inadequately trained or uncommitted teachers. Staff development is critical for the implementation of new programs and teaching methods (Strudler, 1993). If teachers are to use this technology in their classrooms, their need for adequate inservice training programs must be met. Brown, Collins, and Duguid (1989) remind us it is quite possible to acquire a tool but to be unable to use it. For effective usage, many suggestions are provided in the literature concerning teachers' inservice training. Darling-Hammond (1993) posits that to create training programs which change the way people do things, a strong foundation must be built for professional development training and support. Strudler (1993) supports this idea and states:

> Any training and staff development plan for technology must address the broader goal of empowering teachers and students to use information technology as tools throughout the curriculum. It is essential that staff development plans address the broader professional need of teachers (p. 8).

An understanding of the keys to successful inservice is essential if an innovation is to be implemented to its full potential.

Sustained interaction and staff development are crucial for any educational change. However, the more complex the change, the more interaction is required to assure implementation (Fullan, 1991). Within inservice training, teachers must be educated about the relationship between learning and technology, how to facilitate interactivity, and how to operate the technology (Corporation for Public Broadcasting, 1993; Dede, 1990). Support following training is seen as necessary for effective staff development. Follow-up support assists teachers in transferring newly learned skills and practices into their active teaching repertoire (Joyce, 1990; Joyce & Showers, 1988). The Rand Change Agent Study found that even quality innovations could not succeed if teachers were inadequately trained (Berman & MacLauglin, 1977). The quality of the teacher training remains the key to the successful implementation of any new innovation.

Distance Education in Iowa

Distance education using the Iowa Communications Network (ICN) is one form of technology that has been introduced recently in Iowa. The ICN is a statewide two-way full motion interactive fiber-optic telecommunications network with a point of presence (classroom) in each of Iowa's 99 counties. The ICN links colleges, universities and secondary schools throughout the state. This network is being used to offer new and additional courses to schools and students (IDEA, 1992).

During 1993, K-12 educators in Iowa were invited to attend workshops and institutes designed to introduce them to distance education via the ICN. The workshops focused on providing hands-on experience with interactive television technologies, while the insitutes focused on curriculum reform with some attention to implementing reform practices in a distance education environment.

Iowa's vision of distance education is built around the concept of enhancing the quality of education through the use of telecommunications. The ICN combines the use of fiber optic networks, multimedia, and computers to mediate cognitive interactions with the environment. It offers the opportunity to present life contexts that change views of working, thinking, and learning. The technology is not seen as a replacement of the teacher but as a tool that mediates between the student, teacher, and the object of knowledge (Zuccermaglio, 1993). The appropriate use of distance education will encourage and challenge learners to construct their own meaning and to create knowledge. To reach this goal, teachers must be willing to use the technology. An understanding of the factors that contribute to teachers' willingness to use the innovation can be studied through the use of Rogers' (1983) Classical Diffusion Model.

Classical Diffusion Model

Diffusion of innovations is a multidisciplinary theory of planned social change that has brought about the spread of new ideas or new technologies throughout a social system. Rogers (1983) defined diffusion as "the process by which an innovation is communicated through certain channels, over time, among members of a social system" (p. 5). Innovations are adopted at different rates depending on how they are perceived by adopters. There are five characteristics of innovations that influence that decision: relative advantage, compatibility, complexity, trialability, and observability. Rogers (1983) notes that relative advantage is the degree to which an adopter perceives an innovation as an advantage. The greater the perceived advantage, the faster the innovation will be adopted. The compatibility of an innovation with the existing culture and its ability to meet felt needs will also influence its rate of adoption. Innovations seen as compatible with the existing values of a social system will be adopted faster than those that are not perceived as being compatible. The complexity of the innovation is another characteristic that influences the rate of adoption. If an innovation is perceived as being complex to use or understand, it will not be adopted as quickly. Trialability is the opportunity for trying out the new innovation to see if it meets the adopters' needs. Perceived trialability of an innovation is positively related to its rate of adoption. Observability is the degree to which the results of an innovation are observable to others. The greater the degree to which these results can be seen, the higher the rate of adoption (Rogers, 1983).

Diffusion is defined as a particular type of communication in which one person offers information to others about a new idea. The communication channel is the method by which the message is conveyed. Interpersonal channels involve face to face exchange and are more effective in the adoption process. Most adopters make their decision to adopt based on an interpersonal subjective evaluation rather than a scientific evaluation. Thus the use of these channels will influence the process of adoption (Rogers, 1983).

Rogers proposes a five-stage model of the adoption process consisting of knowledge, persuasion, decision, implementation, and confirmation. This study was not conducted to see if the stages of the innovation-decision-process exist. The researchers are using the constructs of knowledge, persuasion, and decision to understand the symbolic adoption of the Iowa Communications Network. Knowledge is defined as an individual's exposure to the innovation's existence and understanding of its functions. Persuasion is the individual's formation of a favorable attitude toward the innovation. Decision is the individual's engagement in activities that lead to a choice to adopt or reject the innovation (Rogers, 1983).

Few studies have looked at inservice training from a diffusion of innovation point of view. Moore and Thompson (1990) posit that it is important to "review the extent and quality of teacher preparation and in-service training in distance education" if we are to understand the process of change (p. 37). Many factors contribute to a teacher's decision to adopt an innovation.

The Study

This study will focus on teacher inservice training and its relationship to willingness to use an innovation such as distance education. The study will provide information for follow-up training activities and insight into the process of adoption as a whole.

The main objectives of this study were:

1. Identification of the factors that contribute to teachers' willingness to teach over the ICN after completion of distance education inservice training.
2. Examination of the relationship between teacher attendance in either the workshop or the institute or attendance in both, and willingness to teach over the ICN.
3. Examination of the relationship between participants' decision to attend the workshop and/or the institute and the participants' knowledge about distance education, their attitude toward distance education, and their willingness to teach over the ICN.

Methodology

Subjects

The subjects of this study were participants in 16 inservice workshops and five curriculum institutes in the Spring, Summer, and Fall of 1993. There were 475 teachers and administrators surveyed. Of the 280 survey respondents, 210 were K-12 teachers. These teachers were the focus of this study.

Instrument

The instrument was developed after examination of other diffusion of innovation and technology instruments (Carr, 1990; Derr, 1991). It was piloted for readability in two graduate technology courses.

The instrument consisted of demographic questions and questions about perceptions of distance education in relation to knowledge, attitude (persuasion), willingness to adopt (decision), and communication channels. Additionally, questions were asked concerning each teacher's personal use of the ICN and factors that would increase the probability of their use of the ICN.

The demographic variables included in the survey were gender, age, area of instruction, highest degree, teaching experience, and level of experience in using distance education. Participants' perceptions about their knowledge, attitude, and willingness to adopt distance education were measured by using a five-point strongly disagree/strongly agree scale. Knowledge was measured by asking participants to respond to the following question: "I believe I am knowledgeable about teaching at a distance." Attitudes towards teaching at a distance were measured by asking respondents to respond to this item: "I believe I have a favorable attitude towards teaching at a distance." The same construct was measured indirectly using Rogers' (1983) taxonomy of the perceived characteristics of the innovation. These include relative advantage, complexity, compatibility, trialability and observability. The coefficient alpha reliability for the attitude scale was .88. Finally, willingness to teach over the ICN was measured with this item: "I am willing to teach over the ICN."

Procedures and Data Analysis

The instrument was mailed to distance education workshop and institute participants after inservice completion and was followed by a reminder postcard. A return rate of 61 percent was obtained. Results were analyzed using the statistical package for Social Sciences (SPSS). Statistics computed were descriptive statistics, stepwise regression, and one-way analysis of variance (ANOVA).

Results

Demographic Characteristics

Demographic characteristics of responding teachers are presented in Table 1. One hundred twelve were female (53%) and 98 (47%) were male. More than two-thirds of the teachers were older than age 40. One hundred forty-two (68%) teachers had more than 15 years of teaching experience. Most teachers (70%) had no experience or little experience using distance education technologies. Seventy-one (34%) teachers attended only the inservice workshops, 53 (26%) teachers attended only the curriculum institutes, and 83 (40%) attended both.

Predicting Factors of Willingness to Use the ICN

Stepwise regression (at the .05 level) was used to identify the predictors of teachers' willingness to teach over the ICN (Borg & Gall, 1989). The independent variables used for this analysis were: (1) knowledge about distance education, (2) general attitude score, (3) sex, (4) age, (5) communication with other teachers, and (6) the school being connected to the ICN. Favorable attitude towards distance education was the primary predictor variable for all three groups (workshop participants, institute participants, and those who attended both). In addition to attitude, teachers' positive conversation with others about distance education predicted curriculum institute teachers' willingness to teach over the ICN.

BEST COPY AVAILABLE

Table 1. *Characteristics of workshop/institute participants*

	N	Percent
Gender		
Females	112	53
Males	98	47
Attended		
Inservice workshop	71	34
Curriculum institute	53	26
Both	83	40
Age		
40 and less	61	29
Greater than 40	148	71
Area		
Foreign Language	29	14
Literacy	23	11
Math	62	30
Science	35	17
Vocational Education	27	13
Elementary	8	4
Other	20	10
Teaching experience (years)		
15 and less	67	32
Greater than 15	142	68
Level of experience using distance education		
No experience	60	29
Very little	85	41
Some	58	28
Quite a bit	4	2
Extensive	2	1

Inservice Attendance

One-way ANOVA (at the .05 level) and Scheffe post hoc procedures (.05 level) were used to identify whether there were significant differences between teachers attending singularly the workshop or institute or attendance at both in their perceptions of knowledge, attitude, and willingness to teach over the ICN (Table 2).

The results showed a significant difference between those who attended the workshop or curriculum institute and those who attended both the workshop and the curriculum institute (F=8.92, P<.001) in their knowledge about distance education. Using the Scheffe range test at the .05 level, there was a difference between those attending both the workshop and the institute and those attending only the institute in their perception of their knowledge about distance education. The knowledge score for those who attended both the workshop and the institute was higher than for those who attended only the institute.

In terms of attitudes toward distance education, the results showed no significant difference between the three groups (F=2.02, P=.136). Teachers' attitude scores were similar in the three groups.

The results showed a significant difference between the three groups in their willingness to use distance education (F=4.74, P<.001). Scheffe analysis showed a difference between those who attended both the workshop and the institute and those who attended either the workshop or the institute. Those who attended both the inservices showed more willingness to teach over the ICN than those who attended only one inservice.

Table 2. *ANOVA results of teachers' perception of their knowledge about, attitude toward, and willingness to use distance education by their attendance at workshops and institutes*

	N	Mean	SD	F-Ratio	Probability	Scheffe
Knowledge				8.09	0.001	B>I
Workshop (W)	72	3.72	0.94			
Institute (I)	53	3.38	0.88			
Both (B)	83	3.94	0.82			
Attitude				2.02	0.136	None
Workshop	72	4.00	0.90			
Institute	53	3.85	0.84			
Both	83	4.12	0.57			
Willingness				4.74	0.001	B>I
Workshop	72	3.76	0.85			B>W
Institute	53	3.74	0.84			
Both	83	4.08	0.63			

Reason for Attending

Respondents were asked what most influenced their decision to attend the inservice(s). Their answers were classified into three categories: personal interest, administrative request, or other reasons. A one-way ANOVA was used to determine if there were significant differences between the three groups in relation to knowledge, attitude and willingness to teach over the ICN (Table 3).

The results showed no statistical difference between teachers who joined the inservice for personal interest, administrative request, or for other reasons in their knowledge about distance education (F=0.80, p=0.451). This indicates that the reason for attending the inservice(s) did not affect their perception of knowledge gained.

The ANOVA results showed a statistical difference between the three groups in their attitude towards distance education (F=4.56, p=0.012). Using Scheffe, there was a difference between those teachers who attended the inservices for personal interest and those who attended because of administrative request. Those reporting personal interest showed a more favorable attitude toward distance education than those attending because of an administrative request.

A statistical difference between the three groups was identified in relation to willingness to use the ICN (F=3.16, p=0.045). Scheffe analysis, however, did not detect any differences between those teachers who attended for personal interest, administrative request, or attended for other reasons, although the mean score for teachers who attended for personal interest or other reasons was higher than those who attended because of an administrative request. Perhaps a more liberal test, such as Tukey, would detect such a difference.

Discussion

Rogers presents a model of the innovation decision process. This study focused on three stages of that model (knowledge, persuasion and decision) in conjunction with the willingness to adopt a distance education technology. Inservice training in distance education serves as the major vehicle for transmitting information and skills to teachers. This study focused on factors that contribute to teachers' willingness to use the technology. The inservices provided teachers with knowledge that corresponds to the first stage of the model. According to Rogers (1983), the second stage of persuasion can be addressed through the study of attitudes. An innovation will have a greater chance of being accepted if individuals form positive attitudes toward the innovation. Inservice training provides an environment that can facilitate this process. This study identified that attitudes toward the innovation are the primary predictor of teachers' willingness to use distance education. Those teachers who formed positive attitudes toward distance education showed more willingness to use the technology.

Teachers who attended both inservices (workshop and institute) showed more knowledge and more willingness to use distance education than those who attended only one inservice. This implies that teachers need more than a "one shot workshop" to adopt new educational technologies (Huberman and Miles, 1984; Hurst,1994; Stallings, 1989). Follow-up experiences are important to support the trainees as they move toward adoption.

Teachers who attended inservices because of personal interest showed a more favorable attitude toward the use of distance education and more willingness to use distance education. It must not be assumed that all teachers come to inservices with the same level of interest in learning about

Table 3. *ANOVA results of teachers' perceptions of their kowledge about, attitude toward, and willingness to to use distance education by their attendance at workshops and institutes*

	N	Mean	SD	F-Ratio	Probability	Scheffe
Knowledge				0.80	0.451	None
Personal Interest (P)	117	3.75	0.83			
Administrative Request (A)	77	3.61	0.89			
Other (O)	12	3.83	0.72			
Attitude				4.56	0.012	P>A
Personal Interest	117	4.13	0.73			
Administrative Request	77	3.79	0.83			
Other	12	4.08	0.69			
Willingness				3.16	0.045	None
Personal Interest	117	3.96	0.79			
Administrative Request	77	3.71	0.78			
Other	12	4.17	0.58			

BEST COPY AVAILABLE

the technology. Therefore, inservice coordinators should include a variety of experiences and viewpoints to address the beliefs and knowledge levels of the participants. In addition, time should be provided for input from the attendees to help tailor the inservices to their needs.

Education is in a state of change; change in curriculum, class structure, and staff development. Changes in teaching practices involve the development of new skills, behaviors, coordinated activities, and technologies (Fullan, 1987). One of the methods Iowa chose to address change in education was the creation of the ICN. This change can only occur if Iowa teachers are willing to use the technology. This study has identified that teachers' positive attitudes toward use of the ICN was a major contributor to the adoption decision. Additionally, follow-up activities and participant's personal interest influenced the decision.

In conclusion, several implications concerning distance education inservice construction can be drawn from this study. First, inservice developers should provide the opportunity for attendees to discuss their concerns, questions, and beliefs about the technology. Second, planned follow-up activities should be part of the staff development process. Finally, inservice developers should take into consideration the attendees' needs and reasons for attending to increase participants' willingness to use the technology.

References

Berman, P. & MacLaughlin, M. (1977). Federal programs supporting educational change, Vol. VIII, Implementing and sustaining innovations. Santa Monica, CA: Rand Corporation.

Borg, W. & Gall, M. (1989). Educational research. An introduction. New York: Longman.

Brown, J., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Research, 32-43.

Carr, D. J. (1990). Adopting the new: Computers in the television newsroom. (Doctoral dissertation, University of Missouri-Columbia). Dissertation Abstracts International, 51, 11A.

Corporation for Public Broadcasting (1993). Lifelines of learning: Distance education and America's rural schools. A Report to the 103rd Congress and the American People Pursuant to Pub. L. 102-356. (ERIC Document Reproduction Service No. ED 357 919)

Darling-Hammond, L. (1993). Building learner centered schools: Developing professional capacity, policy, and political consensus (Center for Technology in Education Technical Report, 28). New York: Bank Street College of Education.

Dede, C. (1990). The evolution of distance learning. Journal of Research on Computing in Education, 22(3), 247-264.

Derr, D. D. (1991). Strategies for overcoming barriers to the use of contemporary instructional technologies in the Minnesota technical college system. (Doctoral dissertation, University of Minnesota). Dissertation Abstracts International, 52, 05A.

IDEA (Iowa Distance Education Alliance). (1992). Partnership for interactive learning through telecommunication (Star Schools grant No. 84.203B). Ames, IA: Iowa State University.

Fullan, M. (1987). Implementing the implementation plan. In M. Wideen & I. Andrews (Eds.), Staff development for school improvement: A focus on the teacher. New York: The Falmer Press.

Fullan, M. (1991). The new meaning of educational change. New York: Teachers College Press.

Garrison, D. (1993). A constructivist view of distance education: An analysis of teaching-learning assumptions. Distance Education, 14(2), 199-211.

Huberman, M. & Miles, M. (1984). Innovation up close. New York: Plenum.

Hurst, D. (1994). Teaching technology to teachers. Educational Leadership, 51(7), 74-6.

Joyce, B. (1990). Changing school culture through staff development. Alexandria, VA: Association for Supervision and Curriculum Development.

Joyce, B. & Showers, B. (1988). Student achievement through staff development. New York: Longman.

Moore, M. G. & Thompson, M. M. (1990). The effects of distance learning: A summary of literature. Research monograph number 2. Southeastern Ohio Telecommunication Consortium. (ERIC Document Reproduction Service No. ED 330 321)

Reigeluth, C. (1994). Systemic change: What is it and why is it needed? Change Newsletter, 1, 1.

Rogers, E. M. (1983). Diffusion of innovations (3rd ed.). New York: Free Press.

Sheingold, K. (1990). Restructuring for learning with technology: The potential for synergy (Center for Technology in Education Technical Report). New York: Bank Street College.

Stallings, J. A. (1989). School achievements effects and staff development: What are some critical factors? Paper presented at the Annual Meeting of the American Educational Research Association.

Strudler, N. (1993). Staff development and technology: A position paper. Journal of Computing in Teacher Education, 9(4), 8-10.

Toffler, A. (1990). Powershift: Knowledge, wealth, and violence at the edge of the twenty-first century. New York: Bantam Books.

Zuccermaglio, C. (1993). Toward a cognitive ergonomics of educational technology. In T. Duffy, J. Lowyck, D. Jonassen, (Eds.), Designing Environments for Constructive Learning. Berlin: Springer-Verlag.

Assessment of Distance Education Implementation in Iowa: Concerns and Indicators of Success

Patsy J. Fagan
Drake University

Rationale and Related Literature

Distance education (instruction occurring with teacher and learners proximally separated) isn't a particularly new phenomenon, but recent advances in telecommunications technologies have focused attention on its potential applications for classroom instruction. As a discipline, distance education is young enough that much of the scholarly literature published well into the 1980s were attempts to define what it is and is not (see, for example, Garrison & Shale, 1987; Keegan, 1990; Rumble, 1989). As a result, in-depth knowledge of distance education within the education community is limited.

Despite this lack of understanding, distance education using telecommunications technologies has spread rapidly throughout the United States. In 1987, one in five states reported "involvement" of K-12 schools in distance education activities. One year later, two-thirds of the states had institutions that had invested in instructional telecommunications, and by 1989, virtually every state had at least one school district that had implemented or planned to implement a distance education program (Office of Technology Assessment, 1989).

Unfortunately, this proliferation of instructional telecommunications programs has not spurred the development of concurrent programs to train teachers for these new technologies. Many teachers facing a television-teaching assignment "are left to grapple with the new program on a 'sink or swim' basis" (Batey & Cowell, 1986), finding their way through trial-and-error or by falling back on techniques and strategies successful in conventional classrooms, but which may prove inappropriate for this new environment.

Distance instruction *is* different. Teachers involved in Minnesota's Interactive Television project reported that they had to change their teaching methods (Office of Technology Assessment, 1989) and experienced telesystem teachers consistently report that preparation is different and takes longer than for conventional classroom instruction (Dillon & Price, 1990; Massoumian, 1989; Burnham, 1988). The questions remain: How can we most effectively address the issue of faculty readiness for distance teaching opportunities? How do we identify and analyze the factors that will enable instructional designers to create successful faculty development interventions?

The Concerns-Based Adoption Model (CBAM) is used to categorize and describe the concerns that professionals have about an innovation, such as distance education (Hall & Hord, 1987). The first dimension of this model deals with Stages of Concern (SoC). The SoC instrument is used to assess where, along a continuum of seven sequential stages, individuals faced with an innovation are. This continuum begins with simple awareness and progresses to the development of ideas for tailoring the innovation to specific needs. The stages (in order) are: Awareness, Informational, Personal, Management, Consequences, Collaboration, and Refocusing. Ideally, the individual progresses through the stages without becoming fixated or "stalled" at any point, although determining if this has happened (by using the SoC instrument) can provide useful information for those charged with implementation of the innovation.

Understanding and valuing the role of attitudes in the change process cannot be underestimated. Anyone who has attempted to break a self-destructive habit (smoking, for example) realizes that just *knowing* that the habit is harmful is not enough to discontinue it. There is an affective dimension that directly influences behavior change—whether adopting a new behavior or abandoning a current one—in individuals. Nasca (1980) described the change process as developing from "relationships among knowledge, attitudes, and behavior." Therefore, looking only at the "hard data" of hours spent teaching in an interactive television

BEST COPY AVAILABLE

classroom, for example, or number of teachers "inserviced" may not supply a comprehensive picture of the situation. While following up on a school's implementation of a major educational restructuring, Robbins (1986) discovered that there were elements of the change that had not been documented initially, but that significantly influenced the outcomes of the project. After the early excitement of the innovation wore off, a noticeable decline in active participation occurred. Only through gathering and studying previously uncollected data related to attitudes, teacher perceptions, and lack of long-term, ongoing support did a clear picture of the problems appear.

The tendency of individuals to continue using an innovation, once adopted, also relies on the effectiveness of the change agent in supporting the implementation process (Rogers, 1983). Faculty who participate in inservice activities designed to introduce an innovation cannot be abandoned once they've been exposed to these new ideas. Research on innovation adoption suggests that "reinforcing messages" of various kinds may encourage continuance in the process of adopting a new idea, product, or strategy.

Individuals expected to participate actively in the implementation of distance education must also be given *time* to develop appropriate skills and experiences. In describing the efforts of school administrators in encouraging professional development among faculty, Daft and Becker (1978) remarked, "The decision to increase the professional level of teachers requires a long-term commitment" (p. 191).

As any instructional designer knows, a solid understanding of the context in which he or she intends to work facilitates effective decision-making. By using the CBAM to create a knowledge base about faculty needs, the designer has an organized source of problem-solving data close at hand. Appropriate interventions (such as inservice workshops or print materials) can then be prescribed to address the teachers' concerns and encourage movement toward a higher stage of concern. This study was initiated to facilitate this information-gathering process and provide a "snapshot" portrait of teacher concerns regarding the implementation of distance education technologies in Iowa, specifically, Iowa's two way interactive fiber optic system, the Iowa Communications Network (ICN).

The research questions that guided this investigation were:

1. What are the concerns of Iowa teachers regarding the implementation of distance education technologies and their participation in this implementation process?

2. Are there correlations that exist between levels of concern and sub-group status, such as number of years teaching, gender, grade level, or participation in professional associations?

The overall goals for this project also included the development of recommendations for inservice activities based on the results of the study. In this way, the hierarchical, ongoing nature of successful inservice is facilitated, as opposed to a "one-shot" solution that ignores the long-term support functions implicit in the adoption and diffusion of this large-scale innovation.

Methodology

Subjects

Seventy-five mathematics teachers participated in a TEA curriculum institute (with some also attending an ICN training workshop) during the 1992-93 academic year. The curriculum institute focused on curriculum reform issues related to NCTM standards with only a brief introduction to the ICN. The workshop focused on hands on training to use the ICN. Each of the mathematics curriculum institute participants was sent a survey and 44 of those questionnaires were returned, providing a 59 percent return rate.

Of these subjects, 26 (59%) were female and 18 (41%) were male. Seven of the respondents (17%) were relatively new to the field, having been a teacher for five years or less. Those with 6 to 20 years of teaching experience accounted for 13 of the responses (30%), and the majority of the subjects (53%) had been teaching for more than 20 years.

A majority of the teachers, 32 (73%), taught grades 9-12. Of the other 13 teachers, six taught grades K-4, three taught grades 5-8, and three taught a mixture of grades 5-12. One teacher omitted the information. Predictably, a majority of the secondary level teachers indicated that they have either a mathematics degree (87%) and/or a mathematics education degree (81%) at either the undergraduate or graduate level.

Instrumentation

The survey instrument consisted of three parts, each of which provided specific information regarding the participants' level of professional activity either with the ICN or with mathematics education reform issues. The first part of the survey instrument was written by Fagan (1991) to assess the level of participation in the Iowa Council of Teachers of Mathematics (ICTM), the National Council of Teachers of Mathematics (NCTM), or other professional mathematics organizations. Participants were asked to indicate in which organization or combination of organizations they participated either through membership, journal reading, conference attendance, publication of articles, and/or conference presentation activity.

The second part of the survey instrument was the Stages of Concern About the Innovation (SoC) Questionnaire developed by Hall, Wallace, and Dossett (1973) as the first dimension of the Concerns-Based Adoption Model (CBAM). The purpose of the CBAM is to diagnose and identify an individual's stage(s) of concern and then prescribe appropriate interventions (inservice workshops) for their resolution and the movement toward higher levels of concern (i.e., impact-related concerns) (Hall & George, 1979).

The SoC questionnaire consists of 35 items from which a respondent's stage(s) of concern can be determined. The reliability of the SoC Questionnaire was determined by a one-week test-retest study conducted during the two and one-half years of research related to SoC (Hall, George, & Rutherford, 1979). The stage score correlations ranged from 0.65 to 0.86; four of the seven correlations were above 0.80 (Hall et al., 1979). For the same study, estimates of internal reliability ranged from 0.64 to 0.83 (Hall et al., 1979). A series of validity studies resulting from its use in longitudinal studies "provided increased confidence that the SoC Questionnaire measures the hypothesized Stages of Concern" (Hall et al., 1979, p. 20).

The third part of the questionnaire was a 59-item Mathematics Teacher Questionnaire developed by the National Council of Teachers of Mathematics (NCTM) to assess the level of implementation of the *Curriculum and Evaluation Standards for School Mathematics* (1989) and the *Professional Standards for Teaching Mathematics* (1991). The 1992 pilot study involving mathematics teachers in grades K-12 in 11 states from 121 schools surveyed their attitudes toward teaching, their instructional practices, and their knowledge of the *Standards* (National Council of Teachers of Mathematics, 1992).

Data Analysis

For each respondent, the data from the Stages of Concern Questionnaire (SoCQ) were transformed into a SoC profile using the Quick Scoring Device for the Stages of Concern Questionnaire developed by Parker and Griffin (1979). The analysis of the profiles was performed using the complete profile interpretation as described in Parker and Griffin. Due to the subjective nature of the interpretations, the investigators conferred on the analysis.

The seven SoC profiles were collapsed into five categories of concerns (Unrelated, Personal Positive, Personal Negative, Task, and Impact) as suggested by Hall, George, and Rutherford (1979). The Unrelated concerns (Stage 0) category describes those participants who at the time of the survey were not overly concerned with the use of the ICN. The two Personal Concerns categories (Stages 1 and 2) contain those teachers whose concern centered most on acquiring information and/or on personal concerns relating to their ability to perform within the required needs of the ICN. Teachers identified as having Personal Positive concerns generally have a positive attitude toward use of the ICN while teachers in the Personal Negative category are more likely to be resistant and negative. The Task-Related concerns category (Stage 3) describes those teachers who are most concerned with management, time, and logistical aspects of the use of the ICN. The teachers identified as having Impact-Related concerns are interested in how the use of the ICN will affect students (Stage 4), working with other teachers (Stage 5), and/or seeing other ideas put into practice or at least tried out (Stage 6).

The SoC categories and data from the Mathematics Education Activity Questions and the Mathematics Teacher Questionnaire were analyzed by frequencies. Crosstabulations were used to examine the distribution of SoC profiles among groups.

Results

Subjects

Of the 44 mathematics teachers who responded to the survey, 19 (43%) participated only in the TEA curriculum institute; 25 (57%) of the teachers participated in both the institute and the ICN workshop. Participation in mathematics education organizations varied from passive (membership, reading professional journals, and attending conferences) to active (making conference presentations and publishing articles). Approximately 60% (26) of the teachers were passively involved; 28% had made conference presentations in addition to one or more of the passive activities.

Stages of Concern

Table 1 indicates the number and percent of teachers at each stage of concern.

Table 1. *Stages of concern of respondents*

Stages of Concern	Number	Percent
Unrelated	1	2.3
Personal Positive	7	15.9
Personal Negative	22	50.0
Task-Related	12	27.3
Impact-Related	2	4.5
Total	44	100.0

Of the five stages of concern, half of the profiles (22) were analyzed as Personal Negative; 12 were analyzed as in the Task-Related concern category (27%).

A description of the 22 teachers who were analyzed as having Personal Negative concerns indicates possible areas for further examination. Some groups appeared to have larger proportions of respondents in the Personal Negative Concerns stage. These groups included:

- Sixty-seven percent (four of six) of the K-4 teachers, compared to 50% (16 of 32) of the 9-12 teachers.
- Eleven of 18 (61%) men, compared to 11 of 26 (42%) women.
- Sixteen of 25 (64%) of the institute/workshop group, compared to six of 19 (32%) of the institute only group.
- Eleven of 22 (50%) teachers who had taught more than 20 years, three of seven (43%) who had taught five years or less, and five of 13 (38%) who had taught 6-20 years.
- Thirteen of 26 (50%) teachers who were passively involved in mathematics education organizations compared to nine of 17 (53%) who were actively involved.

Likewise, the teachers who were placed in the Task-Related Concerns category (N=12) included:

- Seven of 19 (37%) who attended the institute only, compared to five of 25 (20%) who attended the institute/workshop.
- Three of 18 (17%) males, compared to nine of 26 females (35%).
- Seven of 22 (32%) who had taught more than 20 years, two of seven (29%) who had taught five years or less, and three of 13 (23%) who had taught 6-20 years.
- Nine of 32 (28%) who taught grades 9-12, compared to one of six (17%) who taught grades K-4.

Conclusions

The purpose of this study was to identify teachers' stages of concern regarding ICN use. Furthermore, a description of the teachers identified at each stage was attempted in order to suggest appropriate interventions (i.e., inservices and/or workshops) that would facilitate continual implementation of the ICN and prevent stymied growth toward the use of the network. Identifying the concerns that teachers have regarding the implementation of the ICN, then using that information when selecting interventions to address the specific concerns, will assist the teachers in resolving early concerns, in arousing more advanced concerns, and, consequently, to become successful users of the innovation (Hall & Hord, 1987).

The variables of gender, years of teaching, grade level taught, level of participation in mathematics education organizations, and participation in the ICN workshop and/or curriculum institute were considered potential contributing factors to teachers' stages of concern regarding fiber optic network usage (George & Rutherford, 1980; Tye, 1981; Punch & McAtee, 1979).

Unrelated Concerns

The interventions targeted at teachers in one category of concern need to be different from those for teachers in the other categories. The focus of the interventions for teachers in the Unrelated Concerns category needs to be on providing general, overview information in small amounts that is not too detailed (Hall & Hord, 1987). Hall and Hord also suggest the use of a variety of media such as personal conversations, brief reports in staff meetings, the use of a newsletter, and press releases.

Hall, George, and Rutherford (1979) identified teachers with Unrelated concerns profiles (highest peak at Stage 1: Awareness with relatively low scores on all other stages) as experienced users of the innovation. The description of the respondents in this study who were placed in the Unrelated concerns category does not identify them as experienced users of the ICN. Contrarily, in our opinion, these respondents are aware of the ICN through their participation in the workshop and/or institute but are non-users of the system.

Personal Positive

The description of the respondents placed in the Personal Positive category concurs with the description given by Hall, George, and Rutherford (1979) of teachers with the highest peak at Stage 2: Information. The respondents are aware of the ICN but are minimally involved with activities relating to the ICN. According to Hall, George, and Rutherford, these respondents would be open and responsive to gaining more information about the structure and function of the ICN. Support and encouragement, as well as additional information, are requirements for ensuring the continued involvement of these respondents in the implementation process.

Teachers involved in an implementation process who have intense Personal Positive concerns from a positive, proactive perspective are identified as having slightly higher Stage 2 (Information) concerns than Stage 3 (Personal) concerns. In addition to disseminating information about the innovation, interventions need to provide reassurance of the teachers' capability to function with the innovation and evidence that the innovation is enthusiastically received and supported by school district administrators and/or the mathematics consultant (Hall & Hord, 1987). Inservices and workshops need to model the use of simple, easily accomplished activities for the classroom and to encourage the development of activities and curriculum materials that reflect the goals of the ICN.

Personal Negative

Fifty percent of the teachers were identified as having Personal Negative concerns. Teachers who have concerns similar to the respondents are described by Hall, George, and Rutherford (1979) as being more concerned about personal position and well-being than in learning about the substantive nature of the ICN. Their concerns are more personal than informational and, hence, the teachers are likely to be negative toward and resistant to any perceived external pressure to adopt the ICN. Hall, George, and Rutherford note that "even when general, non-threatening attempts are made to discuss the [innovation], the high [personal] concerns are intensified and the [informational concerns] are reduced" (1979, p. 36).

Intervention facilitators need to be supersensitive to the intense personal concerns and provide for more individual attention (Hall & Hord, 1987). If the personal concerns are not identified and addressed early, the implementation process can be prolonged and possibly halted (Hall & Hord, 1987). Identification of and inservice activities for teachers with intense personal concerns is imperative to successful implementation of the ICN.

Although disseminating information is necessary, we suggest accomplishing this by encouraging conversations between positive, enthusiastic users of the ICN and the less informed, more resistant and negative teachers. Additionally, opportunities for the more resistant and negative teachers to observe and work with positive, enthusiastic users of the ICN can assist dissemination of information and resolution of intense personal concerns. An individual approach to inservicing will also aid resolution of intense personal concerns by permitting the facilitator to ascertain more easily the specific personal concerns of the teacher and, thus, individualize the necessary interventions.

Task-Related

The teachers who have been identified as possessing task-related concerns generally have resolved their lower-stage concerns and are focusing more on time, management, and logistics concerns (Hall, George, & Rutherford, 1979). Although not experienced users, these respondents were moderately well-informed about the goals, objectives, and underlying philosophy of the ICN and appeared to be focused on new concerns related to management issues.

The specific concerns of teachers regarding the logistics and management of implementation are constantly changing and remain highly individual. Attempts to use group-based, day-long workshops to inservice teachers with intense management concerns is, therefore, problematic (Hall & Hord, 1987). Instead, Hall and Hord suggest the use of "how-to-do" workshops that focus on specific procedures, a telephone "hot-line" that teachers can call with their dilemmas, a newsletter, or a teachers' manual that can quickly and easily address immediate questions.

The researcher suggests the identification of teachers who have intense task-related concerns and the encouragement of communication among the teachers for support and assistance in answering specific questions related to implementing the ICN. Utilizing a telephone "hot-line" can be expanded to a computer electronic mail system that teachers could access from their classrooms. The ICN consultant/coordinator needs to be available to assist the teachers with individual questions and to give support for the effort.

Impact-Related

The teachers who are the most involved with the ICN are identified as having impact-related concerns. Their concerns relate to the adoption of the ICN and the consequence on student achievement, the effect on collegial relationships with other teachers, and on efforts to redesign curriculum: concerns which describe optimal attributes of mature, experienced, and professional teachers. However, for implementation to be an ultimate success, impact concerns must be resolved (Hall & Hord, 1987).

Teachers with intense impact-related concerns are focusing on the consequence of the innovation on students, collaboration with colleagues, and making improvements to the innovation. Whereas the focus of the interventions for the earlier concerns is on ways to make the use easier and more comfortable for the teachers, the focus of interventions for impact-related concerns is on increasing the effectiveness of the innovation (Hall & Hord, 1987). Although consequence and refocusing concerns emerge naturally, Hall and Hord state that teachers generally need encouragement and support to collaborate with their colleagues. This can be accomplished by providing time and financial support for teachers to collaborate on writing instructional materials for the classroom that reflect the goals of the ICN.

Summary

Mathematics teachers in Iowa who have participated in an ICN workshop and/or a curriculum institute have concerns regarding the implementation of the ICN. The concerns range from those unrelated to the ICN to those related to the impact implementation of the ICN will have.

Teacher concerns may be affected by the variables of gender, years of teaching, grade level, level of participation in mathematics education organizations, and participation in the workshop and/or institute. Of particular interest is the number of teachers in the Personal Negative category who attended both the workshop and curriculum institute compared to the number who only attended the institute. The content and format of the workshop was directed less toward mathematics curriculum reform and more toward use of the equipment. As a result, the participants may have left with more questions pertaining to the use of the ICN than the teachers who attended only the curriculum institute.

Identification of the concerns of teachers involved in the implementation of the ICN is prerequisite to prescribing appropriate inservices and/or workshops that will best address the needs of the teachers. By viewing this issue from the perspective of change and innovation adoption, those individuals charged with implementing usage of the ICN will be armed with the tactics to make this happen. Further research and exploration emphasizing teacher characteristics, degrees of innovativeness, and levels of use will all enrich the ICN knowledge base, as well as expand the growing pool of research on distance education in the United States.

References

Batey, A. & Cowell, R. (1986). Distance education: An overview. Washington, DC: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 278 519)

Burnham, F. (1988, August). An examination of perceptions and motivations of faculty participating in a distance education project. Paper presented at the Teaching at a Distance conference, Madison, WI. (ERIC Document Reproduction Service No. ED 304 133)

Daft, R. & Becker, S. (1978). Innovation in organizations: Innovation adoption in school organizations. New York: Elsevier.

Dillon, C. & Price, M. (1990). Improving teaching at a distance. Stillwater, OK: Oklahoma State University Extension Education. (ERIC Document Reproduction Service No. ED 329 246)

Fagan, P. J. (1991). An analysis of concerns of secondary mathematics teachers in the implementation of the *Curriculum and Evaluation Standards for School Mathematics*. Unpublished doctoral dissertation, Iowa State University, Ames, IA.

Garrison, D. & Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. American Journal of Distance Education, 1(1), 7-13.

George, A. A. & Rutherford, W. L. (1980). Changes in concerns about the innovation related to adopter characteristics, training workshops, and the use of the innovations. Washington, DC: National Institute of Education. (ERIC Document Reproduction Service No. ED 192 450)

Hall, G. E. & George, A. A. (1979). Stages of concern about the innovation: The concept, initial verification and some implications. Austin: Research and Development Center for Teacher Education, The University of Texas. (ERIC Document Reproduction Service No. ED 187 716)

Hall, G. E., George, A. A., & Rutherford, W. L. (1979). Measuring stages of concern about the innovation: A manual for use of the SoC questionnaire (R & D No. 3032). Austin: Research and Development Center for Teacher Education, The University of Texas.

Hall, G. E. & Hord, S. M. (1987). Change in schools: Facilitating the process. Albany: State University of New York.

Hall, G. E. & Rutherford, W. L. (1976). Concerns of teachers about implementing team teaching. Educational Leadership, 34, 227-233.

Hall, G. E. Wallace, R. C., Jr., & Dossett, W. A. (1973). A developmental conceptualization of the adoption process within educational institutions. Austin: Research and Development Center for Teacher Education, The University of Texas.

Keegan, D. (1990). Foundations of distance education (2nd ed.) London: Routledge.

Massoumian, B. (1989). Successful teaching via two-way interactive video. Tech Trends, 34(2), 16-19.

Nasca, D. (1980). A behavioral model for educational change. Bureau of Educational Field Services, State University of New York. (ERIC Document Reproduction Service No. ED 1190 572)

National Council of Teachers of Mathematics. (1989). Curriculum and evaluation standards for school mathematics. Reston, VA: Author.

National Council of Teachers of Mathematics. (1991). Professional standards for teaching mathematics. Reston, VA: Author.

National Council of Teachers of Mathematics. (1992). The road to reform in mathematics education: How far have we traveled? Reston, VA: Author.

BEST COPY AVAILABLE

Office of Technology Assessment. (1989). Linking for learning: A new course for education. (OTA-ET-430). Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. ED 310 766)

Parker, E. W. & Griffin, T. H. (1979). A quick scoring device for the Stages of Concern questionnaire (R & D Report No. 3079). Austin: Research and Development Center for Teacher Education, The University of Texas.

Punch, K. F. & McAtee, W. A. (1979). Accounting for teachers' attitudes towards change. Journal of Educational Administration, 17(2), 171-182.

Robbins, P. (1978). Changing attitudes of teachers, principals, and students: What we didn't measure. Paper presented at the annual meeting of the American Educational Research Association, San Francisco. (ERIC Document Reproduction Service No. ED 270 415)

Rogers, E. M. (1983). Diffusion of innovations (3rd ed.). New York: Free Press.

Rumble, G. (1989). On defining distance education. American Journal of Distance Education, 3(2), 8-21.

Tye, K. A. (1981). Changing our schools: The realities. A study of schooling in the United States (Tech. Rep. No. 30). Los Angeles: California University, Graduate School of Education. (ERIC Document Reproduction Services No. ED 218 241)

Investigating Teacher Change Associated with Distance Learning in Education

Donna J. Merkley
Iowa State University
Mary Bozik
Kathy Oakland
University of Northern Iowa

Introduction

The focus of this study was to determine how three support structures (literacy institute/technology workshops, regional coordinator, and local school district faculty/administration) affected distance education activities of literacy teachers in the state of Iowa. The specific purposes were (1) to determine Stages of Concern and Levels of Use of participating teachers, (2) to determine if specific elements within the support structure affected distance education activities, and (3) to identify needs within the support structure to enhance distance education activities. Two dimensions of the Concerns-Based Adoption Model (CBAM) were used along with individual interviews. Data were triangulated by means of documents, questionnaires, and interviews. The 30 teachers who participated in a five-day, 1993 Teacher Education Alliance (TEA) literacy institute were asked to complete a 35-item Stages of Concern Questionnaire (SoCQ). Analysis of the SoCQ profile indicated two primary stages of concern (stage 0 and stage 5). Four teachers with a peak on their SoCQ profile at either "0" or "5" were invited to participate further in the study. The four members of the study group were asked to submit a biweekly log for seven months in which they recorded encounters with distance education (e.g. conversations, articles read, lessons prepared and taught, lessons facilitated, etc.). At the end of the seven months, two of the four teachers were individually interviewed about their distance education activities and the effect of the support structure in implementing distance education activities.

Significance and Need

Even though advances in telecommunication technologies have created increasing K-12 interest in distance education, the rate of adoption is quite slow (McNeil, 1990; Gunawardena, 1990; Heinich, 1984). The dominant focus of distance education research has been on learner outcomes, learner characteristics, and learner attitudes. As scholars have attempted to formulate a theoretical base for distance education and to compare distance education to conventional education (Holmberg, 1986; Keegan, 1988; Perraton, 1988; Shale, 1988; Peters, 1988; Cropley & Kahl, 1983), researchers have studied student characteristics and course development (Holmberg, 1986; Kaye & Rumble, 1981; Sewart, 1988). Even though the literature in distance education discusses the importance of faculty, this group has been largely neglected by the research (Beaudoin, 1990).

The research on distance education has given scant attention to classroom teacher growth and development within the framework of distance education, yet studies suggest that faculty attitude toward instructional technology is a primary barrier to the continued growth of distance education programs (Stinehart, 1988; Gunawardena, 1990; McNeil, 1990). Shale (1988) maintains that the conditions necessary for the educational process in distance education are the same as those necessary in face-to-face contact. The task of the distance educator is to find ways to ensure these necessary conditions. Others see a modified role for the distance educator.

Beaudoin (1990) explains that distance education revolves around a learner-centered system with the teacher in a facilitating role. That is, the teacher must attend closely to the learning process and augment study materials with explanations, references, and reinforcements for the students. Teachers accustomed to more conventional teaching modes will have to acquire additional skills. They will need to assume expanded roles, not only teaching distance learners, but also organizing learning for independent study. In fact, various studies suggest that successful distance teaching requires use of a different set of skills than those used in traditional teaching (Hackman & Walker, 1990; Strain, 1987; Maloy & Perry, 1991; Burge & Howard, 1991), yet faculty training programs often concentrate primarily on the operation of the technology rather than on how to teach at a distance (Dillon, Hengst, & Zeller, 1991; Cyrs, 1989).

A study of Ohio University faculty who had taught at least one interactive television course (Gehlauf, Schatz & Frye, 1991) compared teaching behaviors in the interactive television courses with the instructors' ideas about effective teaching practices. Results revealed that instructors wanted to cling to more traditional approaches even though they believed audiovisual methods were more effective. The participants in the study stressed the importance of organization, "hands-on" experience, and role playing exercises for training distance teachers.

Many agree that distance learning is an innovation that constitutes a considerable change for classroom teachers. The literature suggests that the ingredient most neglected in the diffusion of distance education is leadership to support change. In contrast, the ingredient most prominent is training. However, training will be successful only if it exists in an environment supportive of change.

For many years researchers have studied how educational institutions adopt, implement, and ultimately institutionalize educational innovations (Fuller, 1969; Hall, Wallace, & Dossett, 1973; Hall, Loucks, Rutherford, & Newlove, 1975). Lindquist (1978) indicated that successful change in education depends on at least five components:

- ownership by those affected;
- access to both information and interpersonal resources;
- leadership that is guiding, involving, and initiating rather than authoritarian, influential, and dogmatic;
- an open environment that seeks out and listens to various opinions; and
- rewards that foster self esteem and personal development.

Fullan (1985) offered six key factors concerning educational change:

- Change is a process happening over time.
- Anxiety and uncertainty are common in initial stages of change.
- Assistance is needed.
- Change occurs through practice and feedback.
- Teachers need to understand the rationale and reason for implementing the change.
- Successful change occurs through interaction with peers and administration.

Guskey (1986) reported that new practices requiring a significant amount of change succeed or die by the amount of assistance teachers receive. Perhaps forceful leadership is the factor that contributes most directly to effective changes in classroom practice. Despite assistance and practice, experienced teachers seldom become committed to an innovation until they have seen that the new practices work well in their classrooms with their students (Guskey, 1986).

Population

Thirty K-12 teachers of reading/language arts from across the state were invited by their regional coordinators for the Star Schools project to participate in a five-day, 1993 summer literacy institute. The goals of the institute were to discuss literacy issues and to explore the potential of distance education for literacy instruction. A three-day technology workshop also was available to introduce teachers to distance education technology and general teaching practices for distance education. Table 1 describes the literary institute participants.

Table 1. *1993 literacy institute participants*

Variable	Number	Percent
Sex		
Male	5	17
Female	25	83
Race		
Caucasian	28	93
Unknown	2	7
Degree held		
Bachelor's	18	62
Master's	11	38
Teaching level		
Elementary	4	15
Middle/High School	22	85

Instrumentation

Researchers at the University of Texas at Austin developed the Concerns-Base Adoption Model (CBAM) as a means to learn more about change in the school improvement process (Hord et al., 1987). The Stages of Concern (SoC) dimension of CBAM is a way of identifying concerns that users, or potential users, have about an innovation. The seven stages are grouped into three levels—SELF, TASK, and IMPACT. Stage 0 (Awareness), Stage 1 (Informational), and Stage 2 (Personal) are part of the SELF level.

During the early stages of implementation, teachers are likely to be at the stages of SELF. The TASK level includes Stage 3 (Management). The IMPACT level includes Stage 4 (Consequence), Stage 5 (Collaboration), and Stage 6 (Refocusing) (Hord et al., 1987; Loucks & Hall, 1977). Once the concerns begin to focus on the effects of the innovation on students and the effectiveness of the implementation, the level of IMPACT has been reached. Table 2 includes representative statements for each level.

Table 2. *Stages of concern*

SELF		
0	Awareness:	I am not concerned about the innovation.
1	Informational:	I would like to know more about the innovation.
2	Personal:	How will using the innovation affect me?
TASK		
3	Management:	I seem to be spending all my time getting ready.
IMPACT		
4	Consequences:	How is the innovation affecting my students?
5	Collaboration:	I am concerned about relating what I am doing with what other instructors are doing.
6	Refocusing:	I have ideas about something that would work even better.

Levels of Use (LoU) interview is another tool of CBAM. This monitoring tool determines how the teacher is using the innovation and how comfortable and skilled the teacher is in getting the students to respond to an innovation. The Levels of Use provide a means of determining if the implementation of the innovation has been successful. There are eight levels of use. The first three levels deal with nonusers: (1) LoU-Nonuse, (2) LoU I-Orientation, (3) LoU II-Preparation. The remaining levels are user levels: (4) LoU III-Mechanical Use, (5) LoU IVA-Routine, (6) LoU IVB-Refinement, (7) LoU V-Integration, and (8) LoU VI-Renewal. Table 3 includes behavioral definitions for each level.

Data Analysis

Data were triangulated by means of documents, questionnaires, and interviews.

Stages of Concern Questionnaire

Individuals move through the stages of concern at different rates. Typically, SELF concerns will be intense at the beginning of the innovation change process. TASK concerns develop next, followed by IMPACT.
Each of the seven stages was represented by five statements on a 35-item questionnaire. Twenty-eight questionnaires were returned. The questionnaires were hand scored, and each profile was plotted to determine the individual's stage of concern. The raw scores (on a scale of 0 to 7) for each section of five statements were converted to percentile scores for interpretation according to Hall et al. (1986). Table 4 shows the individual stages of concern percentile scores for the twenty-eight participants who returned the questionnaire. Eighteen (64% percent) of the teachers were at the SELF dimension (Stages 0, 1, or 2). None of the teachers were at the TASK dimension (3) and ten (36%) of the teachers were at the IMPACT dimension (Stages 4, 5, or 6).

According to the indicators provided by the Stages of Concern Questionnaire, a large percentage of the respondents (46%) were aware of and concerned about distance education and were interested in learning more about the innovation (Stage 0). Many other respondents (36%) were concerned about the collaborative aspects of distance learning (Stage 5).

Logs

The four teachers in the study group were asked to submit biweekly logs for seven months in which they recorded encounters with distance education (e.g. conversations, articles read, lessons prepared and taught, lessons facilitated etc.). Reminders to submit logs were sent to each teacher at the beginning of the month. One of the four teachers submitted log entries via electronic mail. The other three teachers mailed log entries. Two of the four teachers submitted very detailed logs each month. The log entries were analyzed by organizing the contents according to major support structure elements (i.e., literacy institute/technology workshop, regional coordinator, local school district faculty/administration). Table 5 provides samples of the data from the logs indicating teachers' perceptions about the influence of the various support structures on teachers' use of distance education activities.

Interviews: Levels of Use

Two of the study group members who regularly submitted detailed monthly logs were interviewed individually. Data from two semi-structured interviews, each approximately one hour in length, were analyzed to determine the Levels of Use. The two teachers interviewed had submitted detailed monthly logs and were representative of the literacy institute members. They were female high school teachers with bachelor's degrees working in a building with a distance education classroom. Each had completed both the literacy institute and the three-day technology workshop. Interview transcripts were used to determine the teachers' Level of Use of distance education (Loucks, et al., 1975) and to determine the influence of the major support struc-

Table 3. *Stages of Concern*

	Level of Use	Behavioral Definitions of Use
	Nonuse	Has little or no knowledge of distance education and no involvement in the support structure
I.	Orientation:	Has recently acquired information about distance education from the support structure.
II.	Preparation:	Prepares for the first time to become involved in using distance education with assistance from the support structure.
III.	Mechanical Use:	Focuses on short term use of distance education with little reflection. Changes in use are made to meet user needs. User is engaged in a step-by-step attempt to use distance education with use of the support structure. Use may be disjointed/superficial.
IV.	Routine Use:	Shows stable use of distance education with few changes in the process. Little thought has been given to improving distance education through the assistance of the support structure or the consequences of using distance education.
V.	Refinement Use:	Varies the use of distance education through the assistance of the support structure to increase impact on students. Variations are based on knowledge of both long and short-term consequences on students.
VI.	Integration Use:	Combines own efforts to use distance education with activities of other colleagues to achieve a collective impact on students.
VII.	Renewal:	Reevaluates the quality of cooperative learning and support structure, seeks major modifications or alternatives to current reports to increase student impact, examines new developments, and sets new goals.

ture elements (i.e., literacy institute/technology workshop, regional coordinator, local school district faculty/administration).

Findings

Based on the interview responses, the two teachers had little difficulty distinguishing the three support structures. Each of the three components had some influence on these teachers' implementation of distance education activities, but provided varying degrees of support for them in the implementation process. The following summarizes the data from the interviews.

Teacher One

Teacher One was at the self level awareness stage (0) based on the SoCQ scores. The Levels of Use interviews indicated the teacher was at the nonuser preparation level (LoUII).

Teacher One teaches high school English/language arts in a small, rural Iowa community with approximately 250 students in grades 10-12. During 1993-1994, this teacher taught eight different classes, in addition to being the assistant drama director and helping with the all-school spring play.

Teacher One indicated that, in her opinion, the real strength of using the ICN and distance education is that the students and teachers are able to use resources beyond those available in a small town. With limited resources, ICN makes it possible to access all kinds of materials. Being part of the distance education project made her aware of additional materials and resources available to teachers.

In her opinion, the problem with using the ICN and distance education activities was that communication had been very poor. It was extremely difficult to "get through" all the procedures to use the ICN system. In addition, it was difficult to know what was on the system. There was no communication about what might be available that teachers could participate in or become part of.

Literacy institute/technology workshop

This teacher felt that participation in the literacy institute and the technology workshop exposed her to excellent material and created enthusiasm for "the system." The people involved, the experts who were part of the institute and the workshop, and the wonderful variety of material contributed to her enthusiasm.

BEST COPY AVAILABLE

Table 4. *Individual stages of concern percentile scores*

	Self			Task	Impact		
Teacher	Stage 0 Awareness	Stage 1 Informational	Stage 2 Personal	Stage 3 Management	Stage 4 Consequences	Stage 5 Collaboration	Stage 6 Refocusing
1	**91**	69	55	30	11	36	22
2	86	84	91	83	30	**98**	26
3	60	60	83	43	38	**98**	52
4	72	60	78	47	59	**88**	69
5	**96**	84	70	52	24	44	34
6	95	93	**96**	85	54	80	69
7	60	80	78	43	76	**88**	47
8	**95**	84	72	34	33	84	38
9	**96**	84	70	52	24	44	34
10	**91**	69	55	30	11	36	22
11	95	93	**96**	85	54	80	69
12	60	60	83	43	38	**98**	52
13	60	80	78	43	76	**88**	47
14	72	60	78	47	59	**88**	69
15	86	84	91	83	30	**98**	26
16	**95**	84	72	34	33	84	38
17	**91**	88	85	52	66	88	60
18	94	84	**95**	85	48	91	65
19	**98**	57	67	80	11	28	34
20	89	**96**	92	56	11	52	26
21	84	75	**96**	39	76	98	60
22	84	95	89	27	66	**97**	52
23	**93**	80	67	85	86	80	52
24	**99**	88	89	98	71	68	52
25	**95**	93	94	94	86	91	81
26	**94**	84	45	65	1	59	26
27	**98**	95	85	85	43	64	57
28	72	60	45	65	24	**80**	34
Total N[a]	**13**	**1**	**4**	**0**	**0**	**10**	**0**
Total Percentage[b]	**46**	**4**	**14**	**0**	**0**	**36**	**0**

[a] Total number of teachers with highest concern score at this stage.

[b] Total percentage of teachers with highest concern score at this stage.

She felt that the purposes of the literacy institute were to share new directions in literacy with teachers, to allow teachers to share their own successes, to help others find success, and to experience the use of the ICN for literacy endeavors.

> *The biggest benefit of the institute for me was being exposed to all of these new and innovative materials available. It was a shot in the arm. The Literacy Institute was full of ideas, and those ideas are now part of my teaching.*

As a result of the technology workshop, Teacher One reported becoming "a fiber optics nut." The technology workshop leaders covered enough material without becoming too deep for the non-computer people. It was especially helpful for her to have the opportunity to practice on the system and be critiqued.

> *This can only be a positive step for my future as a teacher in a high school in rural Iowa. The technology workshop made me aware of some good teaching practices. I hope to use them on the system in the future.*

Regional coordinator

Teacher One reported that the distance education regional coordinator and her own school district had not influenced her use of the ICN due primarily to two problems: lack of money and lack of communication.

> *Without either, we out in the boondocks feel as if we are sinking.*

Table 5. *Log references to the three support structures*

Literacy Institute/Technology Workshop
- local systems are superior to the systems used during the Institute & Workshop

Regional Coordinator
- area sharing session for Literacy Institute participants
- area principals met via ICN to discuss ICN scheduling & administrative concerns

Local School District Faculty/Administration
- The faculty differ in their philosophy regarding distance education and other technology - We have believers and non believers.
- National Guard spent a day in the building using the ICN for training. Students were very aware of the presence of Guard Members in the school.
- The community college is offering ICN evening courses.
- High school music students used ICN to work with college music professors in preparation for All State.
- Physics students linked via ICN with students from another district to discuss a wind power project.
- Elementary students used the ICN to interview Native Americans in another community.
- Student Councils from six area schools met via ICN to share ideas and goals for the school year.
- A high school Spanish class was a receive site for a program.
- The algebra class used the ICN room overhead camera for a demonstration of the TI 80 graphing calculator.
- The ICN was demonstrated to the Rotary and to the district Parent Advisory committee.
- Whittle Channel One ran a special about the future of fiber optics networks. The program included Vice President Gore who said that all schools should be connected to "the highway" by the year 2000.
- State and local newspaper articles have featured fiber optics. Of the ten newspaper articles summarized, six dealt with political/financial controversies; one focused on the creation of a bipartisan board to oversee the ICN; three dealt with the educational advantages of fiber optics.
- ISEA communication shared concerns that fiber optics communications network is primarily a delivery system for higher education offerings.
- A booklet listing university classes offered via ICN was in the teachers' lounge.
- There is no distance education going on in my school.

Announcing ICN programs and opportunities only through building principals did not appear to be an effective route.

> *Letters to my principal are not enough. Often I do not receive needed information.*

This teacher's distance education involvement has been less than she would like. She used the ICN to present material to other teachers concerning her use of children's literature in high school English classrooms and she hoped to increase her future use of the network. She has plans to share over the system with an English teacher in a neighboring community. She was hopeful that there will be information forthcoming concerning events on the system that might be of benefit to her classes.

Local school district faculty/administration

This teacher felt that a strength of her school was that administrators were very willing to let teachers try anything they might want.

> *My administrators have been supportive and encouraged my use of the network and attendance at conferences.*

A drawback has been that district personnel have all become so busy that it has become impossible to get much accomplished.

> *Even though we are encouraged to try new avenues and taste new products in education, the time is just not there. Neither is the money.*

This teacher strongly suggested that more people in her district be encouraged to get involved in the network and the programs that revolve around it. She felt that involvement would eliminate some of the jokes concerning "cable people" and "computer nuts."

Conclusion

Overall, Teacher One felt that participation in the distance education project contributed to a dramatic change in her view of education.

> *These past two years have opened my mind to possibilities. I want my students to experience the possibilities too. It is very clear to me that, although books are important, there is a world out*

> *there that books cannot make real. There are experiences that books cannot offer, and there are horizons to be explored that the network can offer that books will never touch.*
>
> *There are not a lot of changes that I have made in my teaching, but I will say that I have become a strong supporter of the network and I continually speak up for its many possibilities. Our community is not rich, and most people are unwilling to spend tax dollars on this network. I am one of the network's strongest supporters.*

In the opinion of Teacher One, the potential of the ICN is unlimited. The greatest potential is the ability ICN has to bring the world to rural Iowa.

> *Our limited resources will be doubled, tripled, etc. It will excite students about learning and open their world to possibilities this school system could offer.*

She offered a simple formula to help reach this potential;

> *We need MONEY; we need better COMMUNICATION; we need more KNOWLEDGEABLE TEACHERS; we need COMMUNITY SUPPORT of this network.*

Teacher One's greatest concern for the ICN seemed to be the lack of communication among those working with distance education.

> *It is strange that in an area which is strong on communication and since one of the purposes of the network is to help us communicate, that communication is sorely lacking. Solve the communication problem and the world will be at our feet.*

She indicated that difficulty scheduling the network also makes teachers reluctant to use it. Time is a premium.

> *When we cannot get on the system or have to solve all kinds of problems to determine what is available, we will quickly find other ways to accomplish our educational purposes. Unfortunately, those other ways will probably not involve the network. What a waste for teachers, for students, and for the future.*

Teacher Two

Teacher Two was at the impact level collaboration stage (5) based on the SeCQ scores. The level of this interview indicated the teacher was at the nonuser preparation level (LoUII).

This teacher teaches in a small rural Iowa community with approximately 425 students in grades 9-12. She had five different preparations over the 1993-1994 school year.

During the past year, Teacher Two has been involved in very few ICN activities. She participated in a few fiber conferences with other educators that the regional coordinator organized. She was one of three teachers in her building involved in the distance education project and she reported that she has tried to encourage colleagues in her school to become involved. Although she has not taught over "the system," she has used the equipment in the ICN classroom to teach some of her classes.

Literacy institute/technology workshop

Teacher Two felt that both the literacy institute and the technology workshop greatly influenced her understanding and skill in distance education. She felt that the purpose of the literacy institute was to help teachers become informed, visionary, and enthusiastic about fiber optics. She thought the institute was also designed to offer teachers in the same field fellowship and contact in order to inspire and train each other. This teacher enthusiastically reported that she left the institute better informed and inspired to seek continued training in distance education.

She felt that the literacy institute definitely met, and in many cases exceeded, her expectations.

> *I've benefited a lot from things in terms of oral interpretation, and I've used a lot of the materials that were given. I think one of the results was the vision thing of seeing that there's still a lot for me to learn and not getting in a rut. The number one thing is the inspiration that took place.*

She stated that during the institute she would have liked more time to meet specifically with colleagues who taught the same classes she did, but she benefited from all the curriculum sharing opportunities. Teacher Two reported that the context of the literature update session and the focus of the Internet session during the institute were less helpful to her in her present situation. She added that her region presented a second session on Internet.

> *It had people so fired up, and that's one area we're really behind in at my school. Unfortunately, we were not ever hooked up.*

Teacher Two attended the technology workshop in order to receive more training and "hands on " use of the fiber optics. She thought that the workshop was well organized and well taught.

> *I learned a lot about the use of computers over the system, audio visual, and the use of VCRs.*

> *Although, in my school, and I heard this from several of the other teachers, that most of them don't have VCRs that seem to be able to play over the system or they don't have computers to actually use over the system.*

This teacher would have liked the technology workshop to be longer than three days with more opportunity to practice teaching with "the system." She indicated that she has become more computer literate as a result of the workshop.

> *I hope that I can learn more. So I think the vision thing again, expanding our horizons is the most important thing.*

Regional coordinator

Teacher Two indicated that the regional coordinator has had little influence on her use of the ICN, although the coordinator would frequently invite the teachers to ICN-related activities. The regional coordinator organized three ICN sharing sessions for teachers which Teacher Two attended. She recalled that assessment was the topic of one of the sessions. Teacher Two invited colleagues in her building to attend in order to experience the system.

Teacher Two was concerned about communication among those involved with the ICN. For example, the English teachers in her school were angry because they didn't know there was going to be an advanced placement English course offered over the ICN. The students knew it before the teachers did, and signed up for the class through the guidance counselor. Teacher Two added that she would liked to have been free during that hour to observe the distance AP English class and to learn. She added that she would have liked information on when teachers from various schools were going to be talking about certain things over the system.

Teacher Two indicated that the regional coordinator was accessible, but she had contacted that office only once or twice during the past year. She thought that it would help if the regional coordinator was more visible in the schools and could assist in communicating ICN needs to local school boards.

> *Apparently money seems to be a problem. We can holler all we want but if they say we're not going to release you then it's all to no avail. If people can go to things and they have to take a professional day or something, maybe the school will release them but you can't miss too many days or your students will suffer. You have to pick and choose.*

Local school district faculty/administration

Teacher Two indicated that she works with a principal who is a visionary. He attended the technology workshop and encouraged his teachers to become involved in distance education. He was willing to release teachers for ICN-related activities.

> *I think basically he would just be delighted if one of us could teach over the system.*

Teacher Two indicated, however, the desire for stronger leadership from her principal. She sees distance education as a prime topic for staff development.

> *I would really like to see him more aggressively help to channel us into good courses, and help us think through possible courses we could be teaching on the system and then to make the time for it.*

She and the other two teachers in her building who were trained in distance education seem to share a common vision for the ICN. Those two teachers are more active in their use of the ICN, although she has never had the opportunity to observe them teaching over the system.

Teacher Two felt that colleagues do not seem motivated to be involved in distance education or other educational innovations, and this frustrates her.

> *They don't want to mess around with it. They lecture; they sit on a desk and talk in a monotone. It's tedious. The kids are bored out of their socks. There's active learning going on in very few of the classes. I'd say out of our 45 teachers there are only 5 who are innovative and bubbly.*

She felt that some of her colleagues view distance education as a threat to their teaching position.

> *Things need to be explained very well to them that no it is not going to take jobs away. If anything it's going to add jobs because of the preparatory time needed to be a teacher on this thing.*

Conclusion

Teacher Two seemed anxious to become more active with distance education. She said that she would like to have more fiber conferences with other teachers, and would like to use the ICN to train speech contest judges.

> *All of us know English teachers who have an interest already but can't come to the speech teacher's convention in Des Moines to renew their certification in judging. They could do it over the system.*

She suggested that even speech teacher meetings could take place via ICN and made several suggestions to administrators concerning various speech activities with other schools.

BEST COPY AVAILABLE

Teacher Two emphasized that school boards need to embrace the vision and support principals and teachers financially as they experiment with distance education. This is especially crucial due to the budget constraints of local schools.

> *If grant money was available to put into high schools to free people like myself who have a vision for this, I could use that time to prepare courses.*

Teacher Two felt that financial concerns have contributed to the ICN not approaching its potential.

> *The school board seems kind of hesitant or afraid or they think of the cost, and they don't have the money.*

Concerns raised by administrators were financial and "how we could do it-lack of belief." This teacher felt that a prevailing attitude is that ICN activities would take much more release time for teachers to prepare and that ICN would cost more money.

She indicated that the ICN could offer the advantages of extending curriculum and students' environmental boundaries. She also sees ICN potential for courses for teachers (continuing education and inservice) and as a vehicle for communication between schools. She added that the ICN has not begun to realize its potential.

Summary

Data were gathered in order to determine how the three support structures (literacy institutes/technology workshop, regional coordinator, and local school district administration/faculty) affected the use of distance education among literacy teachers. Two dimensions of the Concerns-Based Adoption Model (CBAM) were used along with individual interviews. Data were triangulated by means of documents, questionnaires, and interviews.

The 30 teachers who participated in a five-day, 1993 TEA literacy institute were asked to complete a 35-item Stages of Concern Questionnaire (SoCQ). Four of these teachers were invited to participate further. They submitted biweekly logs for seven months in which they recorded encounters with distance education. At the end of the seven months, two of the four teachers were individually interviewed about their distance education activities and the effect of support structures in implementing distance education activities.

The individual stages of concern percentile scores for the 28 literacy institute participants who returned the questionnaire were typical of respondents at the initial phases of an innovation. Eighteen (64%) of the teachers were at the SELF dimension. That is, many of the respondents were aware of and concerned about distance learning and were interested in learning more about the innovation. None of the teachers were at the TASK dimension, and 10 (36%) of the teachers were at the IMPACT dimension (Stages 4, 5, or 6). Many respondents were concerned about the collaborative aspects of distance learning (Stage 5).

The log entries of the study group members indicated that the ICN classrooms were being used for a variety of student experiences. However, none was initiated by literacy institute participants or received by them. Only one of the classroom activities described, (the elementary students' interviews of Native Americans), might be considered "English/language arts related." Logs praised the ICN advantage to rural Iowa as a means to save time in travel and to allow teachers to receive information or assistance from other professionals. However, there appeared to be little ICN activity related to inservice or professional networking. No reference was made concerning the school administrators' role in encouraging or supporting ICN classroom activities.

None of the teachers' logs mentioned communications from TEA personnel, although each literacy institute participant received the TEA newsletter, TEA Times (nineteen issues were published). The literacy institute participants also were sent three communications from the TEA literacy consultants concerning censorship, assessment, and standards and were informed about whom to contact concerning procedures for initiating school electronic mail hook-up. In addition, there was scant mention of any contact with or communication from the regional Star Schools coordinator.

Interview responses from two teachers were analyzed to identify the teachers' Level of Use of distance education and to identify the needs within the support structure to enhance distance education activities. The teachers' responses indicated that both were at the Preparation Level; each had acquired information about distance education and were preparing to become involved in distance education with assistance from the support structure. The interviews indicated that the teachers were enthusiastic about distance education and the potential of the ICN for both students and teachers, although both reported slow adoption of and little widespread use of "the system." Neither mentioned a "barrier attitude" toward the technology or hesitancy on the part of administrators. In fact, in both cases, the immediate leadership was supportive. The teachers did express disappointment in the inefficiency of scheduling ICN use and also expressed concern about the isolation of rural teachers and students.

The teachers interviewed were very positive about the training that was part of their introduction to distance education. The content, the organization, the climate and the personnel of both the literacy institute and the technology workshop were highly praised. It would appear, however, that in the individual districts and regions, the amount of support and reinforcement received did not sustain initial enthusiasm nor develop initial interest to the point that the teachers initiated or sought ICN activities for themselves or their students. Their comments indicated that the total school climate was not supportive of the distance education innovation.

> *I have had very little positive feedback from some colleagues; in particular the math and science people were 'turned off' after their workshops, so they have not been responsive to my enthusiasm for it. I really have not had a person in my building who has encouraged this network.*

Even these experienced teachers needed continued guidance and encouragement from leadership. This did not appear to be adequately available at the local level, from the regional coordinator or from the TEA personnel. Some of the teachers' comments suggest a prevailing attitude that school use of the ICN is/should be relegated to transmitting coursework. For example, one teacher wondered,

> *Can a regular speech teacher teach over the system or do you indeed have to know advanced calculus or something really new and innovative? I think that some of the teachers feel that, that they're not good enough, smart enough, or by gosh, don't know if anyone likes them. That's one of the problems, that inferiority thing.*

During the majority of the interviews, scant mention was made of innovative use of the ICN for "special activities."

Evidence gathered suggested that elements within the support structures needed to be modified in order to increase use. Ultimately, it is the opportunity for meaningful involvement, professional development, and institutional support that are the key factors in promoting faculty receptivity and significant contributions to distance education programs.

- Teachers will need assistance in assuming ownership of the ICN. It is possible that they perceive the system as outside their locus of control.

- Teachers require easier access to information and to resources as well as the time to use these resources.

- Teachers can greatly benefit from interaction with peers as they wrestle with the teaching demands and rewards of distance education. This could be as simple as exposing faculty to case studies of successful distance education activities, as well as encouraging faculty to attend state and regional education conferences and familiarizing them with journals specializing in distance education.

- Schools or regions should establish an ACTIVE distance education services team or advisory board across departmental lines to keep information and training current.

- Staff development endeavors must address ICN teaching techniques including:
  (a) methods to establish and maintain effective communication between teacher and students;
  (b) methods to increase interaction among students;
  (c) strategies for encouraging individual and group motivation;
  (d) techniques for planning and managing organizational details; and
  (e) awareness of the time demands of distance delivered courses.

References

Beaudoin, M. (1990). The instructor's changing role in distance education. The American Journal of Distance Education, 4(2), 21-29.

Burge, E. J., & Howard, J. L. (1991). Audioconferencing in graduate education: A case study. The American Journal of Distance Education, 4(2), 3-13.

Cropley, A., & Kahl, T. (1983). Distance education and distance learning: Some psychological considerations. Distance Education, 2(3), 45-54.

Cyrs, T. E. (1989). Designing a teleclass instructor's workshop addressing the differential skills needed for quality teleclass teaching [Summary]. Proceedings of the 5th Annual Conference on Teaching at a Distance. Madison, Wisconsin: University of Wisconsin, School of Education, 178-183.

Dillon, C., Hengst, H., & Zoeller, D. (1991). Instructional strategies and student involvement in distance education: A study of the Oklahoma televised instruction system. Journal of Distance Education, 6(1), 28-41.

Fullan, M. (1985). Change processes and strategies at the local level. The Elementary School Journal, 85(3), 391-420.

Fuller, F. (1969). Concerns of teachers: A developmental conceptualization. American Research Journal, 6, 207-226.

Gehlauf, D., Schatz, M., & Frye, T. (1991). Faculty perceptions of interactive television instructional strategies: Implications for training. The American Journal of Distance Education, 5(3), 20-28.

Gunawardena, C. N. (1990). Integrating telecommunication systems to reach distance learners. The American Journal of Distance Education, 4(3), 38-46.

Guskey, T. (1986). Staff development and the process of teacher change. Educational Researcher, 15(5), 5-12.

Hackman, M. Z. & Walker, K. B. (1990). Instructional communication in the televised classroom: The effects of system design and immediacy on student learning and satisfaction. Communication Education, 39(3), 196-206.

Hall, G. E., Loucks, S., Rutherford, W., & Newlove, B. (1975). Levels of use of the innovation: A framework for analyzing innovation adoption. Journal of Teacher Education, 26(1), 52-56.

Hall, G. E., Wallace, R. D., & Dossett, W. A. (1973). A developmental conceptualization of the adoption process within educational institutions. Research and Development Center for Teacher Education, Austin, Texas: The University of Texas.

Heinich, R. (1984). The proper study of instructional technology. Educational Communication and Technology Journal, 32(2), 67-88.

Holmberg, B. (1986). Growth and structure of distance education. London: Croom Helm.

Hord, S. M., Rutherford, W. L., Huling-Austin, L., & Hall, G. E. (1987). Taking charge of change. Austin, Texas: Southwest Educational Development Laboratory.

Kaye, A., & Rumble, G. (1981). Distance teaching for higher and adult education. London: Croom Helm.

Keegan, D. (1988). On defining distance education. In D. Sewart, D. Keegan & B. Holmberg (Eds.) Distance education: International perspectives. New York: Routledge.

Lindquist, J. (1978). Strategies for change. Berkeley, California: Pacific Soundings Press.

Loucks, S. F., & Hall, G. E. (1977). Assessing and facilitating the implementation of innovations: A new approach. Educational Technology, 17(2), 18-21.

Loucks, S. F., Newlove, B. W., & Hall, G. E. (1975). Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters. Austin, Texas: Southwest Educational Development Laboratory.

Maloy, W. L., & Perry, N. N. (1991). A Navy video teletraining project: Lessons learned. The American Journal of Distance Education, 5(2), 40-50.

McNeil, D. R. (1990). Wiring the ivory tower: A round table on technology in higher education. Washington D.C.: Academy for Educational Development.

Perraton, H. (1988). A theory for distance education. In D. Steward, D. Keegan & B. Holmberg (Eds.), Distance education: International perspectives. New York: Routledge.

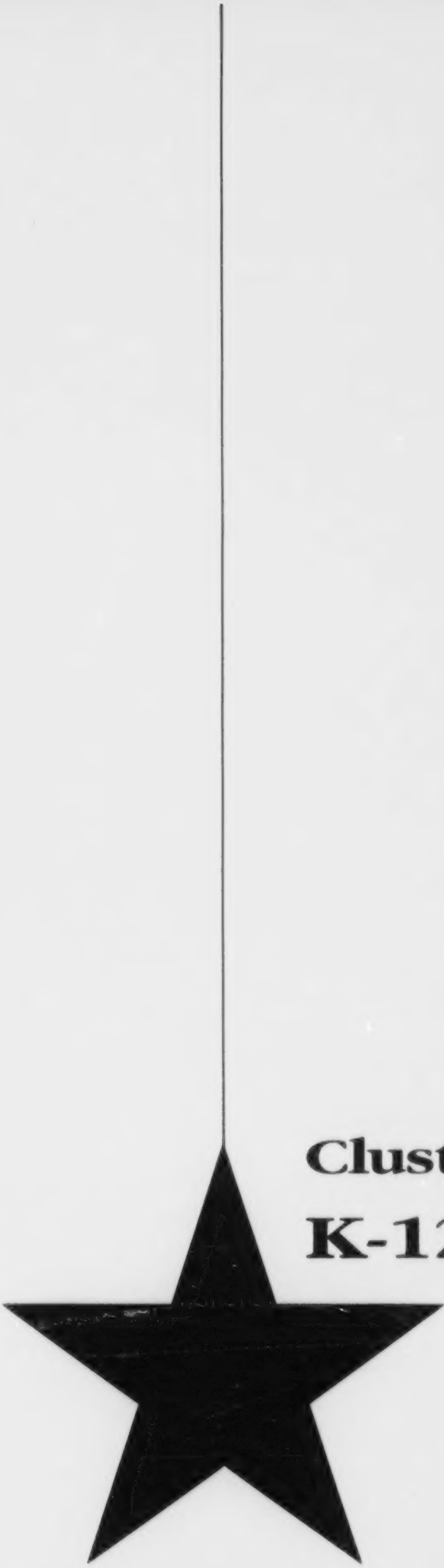
• Peters, O. (1988). Distance teaching and industrial production: A comparative interpretation in outline. In D. Sewart, D. Keegan & B. Holmberg (Eds.), Distance education: International perspectives. New York: Routledge.

Sewart, D. (1988). Distance teaching: A contradiction in terms? In D. Sewart, D. Keegan & B. Holmberg (Eds.), Distance education: International perspectives. New York: Routledge.

Shale, J. (1988). Toward a reconceptualization of distance education. The American Journal of Distance Education, 2(3), 25-34.

Stinehart, K. (1988). Increasing faculty involvement in distance teaching. In D. Sewart & J. S. Daniel (Eds.), Developing distance education. Oslo: International Council for Distance Education, 412-415.

Strain, J. (1987). The role of the faculty member in distance education. The American Journal of Distance Education, 1(2), 61-65.



Cluster 2:

K-12 Teacher Attitudes Toward Distance Education

Family and Consumer Sciences Secondary School Teachers' Orientations Toward Distance Education Technology for Curriculum Delivery

Lemonia Nitsa Bigilaki, Margaret Torrie, and Cheryl Hausafus
Iowa State University

Introduction

The purpose of this study was to identify family and consumer sciences secondary school teachers' self-reported knowledge, ability, interests, feelings, beliefs, and teaching preferences toward interactive teleteaching when using curriculum competencies.

The research was based on two specific objectives:

1. Identify family and consumer sciences secondary school teachers' self-reported knowledge, ability, interests, feelings, and teaching preferences toward the use of interactive teleteaching.

2. Determine whether family and consumer sciences secondary school teachers believe that curriculum competencies can be taught via an interactive teleteaching classroom.

Operational Definition

The questionnaire "Use of interactive distance education teleteaching technology for family and consumer sciences competencies" was used to measure the following constructs: knowledge, ability, interests, feelings, beliefs and teaching preferences. Because the questionnaire was designed to assess the aforementioned constructs based on teachers' responses, all the constructs were recognized as self-reported ones. In this study, the term orientations embraced all the measuring constructs such as knowledge, ability, interests, feelings, beliefs, and teaching preferences.

Significance and Need

The term distance education has a variety of meanings since it has been used as a medium for teaching in many different forms. In the state of Iowa distance education is implemented through the Iowa Communications Network System (ICN). This system permits two-way audio and video communications between ICN sites. Currently there are 157 video sites connected to the network. A future development plan will include more sites which will connect public and private school districts, area education agencies and public libraries throughout the state (Iowa Public Television, 1996).

This study focuses on teachers as an investigation group because although it is technology that removes the barriers and expands opportunities for learning, it is the teacher who teaches (United States Congress, 1989, p. 11). Successful operation of a distance learning classroom requires the knowledge, ability, skills, and cooperation of a number of individuals. The teacher is especially responsible for class content, design and delivery of instruction, degree of interactivity, and students evaluation at all remote sites and origination site (Anderson, 1996). Also, Collis, Veen, and De Vries (1993) stated that necessary knowledge and skills are required for distance education teachers in order to be effective. According to Stewart (1996) the next decade will be a period of rapid change regarding the use of technology in family and consumer sciences. Improved hardware and software such as laser disks, interactive video, and distance learning facilitities will enhance the integration of technology. Findings of her research review indicated a continuing need for in-service education regarding integration of technology for family and consumer sciences teachers (p. 258).

Family and Consumer Sciences is the only curriculum area that focuses entirely on practical living skills related to family life and occupations which enhance the work of the family (Iowa Department of Education, 1993, p. HE-9). With their emphasis on families, family and consumer sciences programs have been part of the secondary school curriculum for over 75 years. They prepare students for the multiple roles of family member, worker, citizen, and community member (Iowa Department of Education, 1993, p. HE-9). The Iowa Department of Education (1993) stated that competencies function as the basis for building the instructional program. Competencies are defined as "learned behaviors which can be accurately repeated and measured to a predetermined standard" (p. 5). Family and consumer sciences competencies refer to: a) housing and home management, b) food and nutrition, c) individual and family health, d) family living and parenthood, e) consumer education, f) textiles and clothing, g) child development (Iowa Department of Education, 1993).

Studies were conducted over the ICN which examined knowledge, ability, interests, and learning preferences of teachers toward interactive teleteaching using K-12 teachers, secondary family and consumer sciences teachers, secondary health teachers, and secondary vocational teachers as their population sample. There were however no studies found in this regard which exclusively examined family and consumer sciences secondary school teachers. Thus there was a need to identify family and consumer sciences secondary school teachers' self-reported knowledge, ability, interests, feelings, and teaching preferences toward interactive teleteaching. The results of these studies will be used by family consumer sciences teacher educators and curriculum specialists as they plan to develop future resources in the area of interactive distance education technology.

Methodology

This study was descriptive in nature and involved the use of a mailed questionnaire. The questionnaire was developed by the researcher after an extensive review of literature and careful consideration of studies over the Iowa Communications Network. The questionnaire was reviewed by a panel of experts and pilot-tested by students (undergraduate and graduate) in the Department of Family and Consumer Sciences at Iowa State University. The panel of experts examined both the questionnaire's construct-related and content-related evidence of validity.

The questionnaire contained three parts. The first part assessed self-reported knowledge relative to interactive teleteaching, ability to use interactive teleteaching technology, interest toward using prepared lesson plans with the help of other professionals, and feelings toward interactive teleteaching and family and consumer sciences courses. The second part of the questionnaire asked teachers to indicate their beliefs about whether family and consumer sciences competencies can be taught via an interactive teleteaching classroom. The third part of the questionnaire requested information about the respondents' professional development and current professional responsibilities including interactive teleteaching pedagogy. It also requested information about the teachers' preferences regarding the methods of acquisition and improvement of their skills in teleteaching.

Instead of answering directly on the questionnaire, teachers were provided an answer sheet which was machine scored. They responded by darkening a number between one and five on the machine scored answer sheet for each of the statements on the questionnaire. The scale for teachers' self-reported knowledge was as follows: none (1), very little (2), some (3), quite a bit (4) and extensive (5). The scale for teachers' self-reported ability was very inadequate (1), inadequate (2), unknown (3), adequate (4) and very adequate (5). For teachers' self-reported interests, the scale was absolutely not (1), probably not (2), not sure (3), probably yes (4) and absolutely yes (5). The scale for teachers' self-reported feelings was strongly disagree (1), somewhat disagree (2), neither agree nor disagree (3), somewhat agree (4) and strongly agree (5).

In the second part, which reported teachers' self-reported beliefs relative to interactive teleteaching when using curriculum competencies, the scale read strongly disbelieve (1), don't believe (2), undecided (3), believe (4) and strongly believe (5). In the third part concerning teachers' professional development, professional responsibilities and preferences the choices were do apply (1) and do not apply (5).

A random selection approach was used in order to reach a large number of respondents in diverse geographical areas within the state of Iowa. Two hundred and fifty from a total of 445 family and consumer sciences secondary school teachers were selected by a computerized random selection technique from the 1994-95 Iowa Educational Director List Data Base (Iowa Department of Education, 1995). Numerous comments were made by teachers regarding their general lack of experience and unfamiliarity with the Iowa Communications Network System. These attitudes contributed to the response rate; 112 teachers (45% of the invited sample) became the data producing sample of this study.

Results and Discussion

Profile of participants

A total of 112 usable responses were returned to the researcher, a response rate of 45%. The majority of respondents (41%) reported that they had taught 11 to 20 years. Twenty-one of the respondents (19%) had 10 or fewer years of teaching experience. Thirty-eight of the respondents (34%) reported 21 to 30 years. Only seven of the respondents (6%) had 31 or more years of experience. More than two-thirds of the respondents (69%) indicated their highest level of formal education as a Bachelor's degree and about one-third (31%) held a Master's degree. None of the participants had a Ph.D. degree.

Forty-four of the respondents (39%) had attended an "in-house" area education agency on teleteaching distance education. Eight teachers (7%) had attended a Star Schools in service workshop on teleteaching methodology. Only five teachers (5%) had attended an in-service on distance education through the Star Schools vocational Curriculum Institutes. Approximately 50% of the respondents had not attended any formal presentation on interactive teleteaching. When asked how they have learned to use the teleteaching classroom 33 teachers (30%) indicated they had learned from other teachers and 32 of the respondents (29%) had learned through in-service. Nineteen of the respondents (17%) were self-taught from printed materials and 10 (9%) had learned from technicians. Eight teachers (7%) indicated learning from a graduate teacher education course and only two (2%) had learned from a preservice teacher education course.

When asked how they would prefer to learn about and improve their skills in the teleteaching classroom, 99 teachers (88%) responded through in-service and 96 teachers (86%) responded from other teachers. Two-thirds of teachers (66%) preferred to learn from technicians followed by teacher education courses at the graduate level (52%) and preservice (40%). More than a third of participants preferred to learn from a how-to-do it videotape and only 21 teachers (19%) preferred printed materials.

When asked how they would prefer to teach a teleteaching interactive class, almost two thirds of teachers (60%) preferred to teach with one or two simultaneous sites, while less preferred three to five sites (22%) and six or more (8%). In addition, more than two-thirds (68%) preferred team teaching and a comparable number preferred turn teaching (63%). Team teaching is the situation where each teacher is involved at all instructional sessions, while turn teaching is where each teacher involved takes responsibility for a segment of the class (see Table 1).

Table 1. Frequencies and percentages of teachers' years of experience, education, and professional responsibilities

Characteristic	**DO APPLY***	
	n	**%**
Years as an educator:		
1-5 years	10	8.9
6-10 years	11	9.8
11-20 years	46	41.1
21-30 years	38	33.9
31 plus	7	6.3
Highest Degree Held:		
Bachelor's Degree	77	68.8
Master's Degree	35	31.3
Doctoral Degree	-	-
Have you ATTENDED any of the following:		
An in-service on distance education through the STAR Schools Vocational Curriculum Institutes	8	7.1
A Star Schools in-service workshop on teleteaching methodology	5	4.5
An "in-house", area education agency or other session on teleteaching/distance education	44	39.3
How HAVE you learned to use the teleteaching?		
In-service	32	28.6
Self-taught from printed material	19	17.0
Viewed a how-to-do-it video tape	5	4.5
From other teachers	33	29.5
From technicians	10	8.9
Preservice teacher education course	2	1.8
Graduate teacher education course	8	7.1
How would you PREFER to learn and/or improve your skills in the teleteaching classroom?		
In-service	99	88.4
Self-teaching from printed material	21	18.8
Viewing from a how-to-do-it video tape	42	37.5
From other teachers	96	85.7
From technicians	74	66.1
Preservice teacher education course	45	40.2
Graduate teacher education course	58	51.8

Table 1. (cont.)

How would you PREFER to teach a teleteaching class?		
With one or two simultaneous remote sites	67	59.8
With three to five simultaneous remote sites	25	22.3
With six or more simultaneous remote sites	9	8.0
With "turn teaching" where each teacher involved takes responsibility for a segment of the class	70	62.5
With "team teaching" where each teacher is involved at all instructional sessions	76	67.9

* DO APPLY refers to number (1) choice

Interactive Teleteaching Technology and Family and Consumer Sciences Competencies

Four major research questions were:

1. Does years of experience of family and consumer sciences secondary school teachers have an effect on their knowledge, ability, interests, feelings and teaching preferences?

2.Does educational level of family and consumer sciences secondary school teachers have an effect on their knowledge, ability, interests, feelings and teaching preferences?

3.Does years of experience of family and consumer sciences secondary school teachers have an effect on their beliefs?

4.Does educational level of family and consumer sciences secondary school teachers have an effect on their beliefs?

As indicated in Table 2, respondents were asked to indicate their level of knowledge relative to distance education interactive teleteaching, integration of academics and technology into family and consumer sciences, interactive teleteaching equipment, applications of interactive teleteaching to family and consumer sciences, and creations of teleteaching plans for distance education. The response scale for teachers knowledge ranged from none (1) to extensive (5). Item means ranged from 1.58 to 2.80 and the overall mean for the section was 2.15. The item teachers knew the least about was how to create teleteaching plans for distance education (item mean 1.58). The item teachers knew the most about was techniques to integrate academics and technology into family and consumer sciences (item mean 2.80). The second item teachers knew something about was distance education interactive teleteaching technology (item mean 2.25).

Table 2 summarizes teachers' self-rated ability to perform their teaching role in an interactive teleteaching environment. Eight items were listed for teachers to consider, with a response pattern ranging from very inadequate (1) to very adequate (5). Teachers rated themselves weakest in their ability to handle the unexpected technical problems with ease (item mean 2.09) and highest in their ability to speak clearly with adequate volume and tone appropriate for teleteaching (item mean 3.32). With the exception of speaking ability all other items were rated inadequate to unknown. The overall mean score for these items was 2.50.

Teachers' interest in using prepared teleteaching materials which require the use of resource persons (professionals within and outside their discipline) were also summarized in Table 2. The response scale ranged from absolutely not (1) to absolutely yes (5). The item means ranged from 3.57 to 4.01. The overall mean for the section was 3.87. With the exception of a guest speaker from an outside agency (item mean 4.01), all of the items were rated not sure (1) to probably yes (4).

Teachers' feelings about family and consumer sciences courses and interactive teleteaching instructional techniques were summarized in Table 2 as well. The response scale ranged from strongly disagree (1) to strongly agree (5). The item means ranged from 2.14 to 3.64. Six items were rated neither agree or disagree to somewhat agree and the remaining three were rated somewhat disagree to neither agree or disagree. The overall mean score of the section was 3.1, indicating a neutral reaction among teachers.

BEST COPY AVAILABLE

Table 2.Descriptive statistics (means and standard deviations) in each variable for knowledge, ability, interests, and feelings

Characteristic	Mean	SD
KNOWLEDGE		
Techniques for integrating academics and technology into family and consumer sciences	2.80	0.94
Distance education interactive teleteaching technology	2.26	0.89
Equipment used in interactive teleteaching	2.22	0.90
Applications of distance education teleteaching to family and consumer sciences	1.95	0.81
Creating teleteaching plans for distance education	1.58	0.73
ABILITY		
Speak clearly with adequate volume, and tone appropriate for teleteaching	3.32	1.10
Evaluate mini-lessons taught via distance education interactive teleteaching	2.66	1.08
Employ a variety of teaching strategies via interactive teleteaching	2.60	1.02
Use interactive teleteaching to supplement a traditional class with a guest speaker	2.52	1.17
Attend to classroom management responsibilities at separate teleteaching sites	2.46	1.14
Operate the equipment utilized in an interactive teleteaching classroom	2.21	1.08
Use interactive teleteaching to present an entire course	2.17	1.03
Handle the unexpected technical problems with ease	2.09	1.09
INTERESTS		
Would you be interested in using a teleteaching lesson plan if it included a:		
Guest speaker from an outside agency?	4.01	0.83
Panel of employers prepared to address student questions?	3.99	0.82
Team teacher within the FCS discipline?	3.92	0.87
Job interview of students by professionals?	3.87	0.88
Team teacher outside the FCS discipline?	3.57	0.96
FEELINGS		
Interactive teleteaching is too complicated for me to do*	3.64	1.01
Interactive distance education is a valuable teaching method for Family and Consumer Sciences courses	3.63	0.79
Using interactive teleteaching for instruction makes teaching and learning too mechanical*	3.30	0.98
Interactive teleteaching does not allow social interaction in a class*	3.25	0.96
I prefer using interactive distance education with students who have previously experienced learning this way	3.06	0.59
I am uncomfortable when I use interactive teleteaching equipment*	3.01	0.85
I feel uneasy teaching through interactive distance education*	2.96	0.83
Interactive teleteaching should be used in all FCS subject areas	2.85	1.01
I consider myself informed about the use of interactive teleteaching in the schools	2.14	1.18

* Negative stated items which were reversed

A reliability test was run for the four scales (knowledge, ability, interests, and feelings) to determine their internal consistency. The reliability test for the knowledge scale produced a coefficient alpha of 0.84. The reliability test for the ability scale produced a coefficient alpha of 0.92. For the interests scale the coefficient alpha was 0.86, and the coefficient alpha was 0.62 for the feelings scale. However, when three items were removed, the coefficient alpha increased to 0.75. Those items referred to statements such as "interactive teleteaching should be used in all family and consumer sciences subject areas", "I prefer using interactive distance education with students who have previously experienced learning in this way", "I consider myself informed about the use of interactive teleteaching in the schools".

Pearson correlations were calculated for the four scales (knowledge, ability, interests, and feelings) to identify their degree of association. Results indicated that there was a relatively close relationship between knowledge and ability (r= 0.52), a relatively close relationship between interests and feelings (r= 0.42), and a less close relationship between knowledge and feelings (r= 0.39) (see Table 3).

Table 3.Correlations among knowledge, ability, interests and feelings

	KNOW	ABIL	INTER	FEEL
KNOW	1.00			
ABIL	.51**	1.00		
INTER	.28**	.15	1.00	
FEEL	.39**	.28**	.42**	1.00

**p£.01.

KNOW=Knowledge
ABIL=Ability
INTER=Interests
FEEL=Feelings

One-way analyses of variance (ANOVA) were run to examine the first major research question. Due to the small number of respondents in four categories (1 to 5, 6 to 10, 21 to 30 and 31 or more years) of the five, three main categories were reproduced for the statistical purposes: 1 to 10 years, 11 to 20, and 21 or more years. One-way ANOVA revealed that there were no significant differences among family and consumer sciences secondary school teachers' knowledge, ability, interests, and feelings when compared to their years of experience (see Table 4).

Table 4. ANOVA: Effect of years as an educator[a] on knowledge, ability, interests, and feelings

Variable	Source	Mean square	F value	Sig. of F
KNOWLEDGE				
	Between GR	0.584	1.277	0.282
	Within GR	0.457		
ABILITY				
	Between GR.	0.744	0.952	0.389
	Within GR.	0.781		
INTERESTS				
	Between GR.	0.258	0.514	0.599
	Within GR.	0.502		
FEELINGS				
	Between GR.	0.179	0.831	0.438
	Within GR.	0.215		

p£.05.
[a] Groups are: 1-10, 11-20, and 21 or more

To examine the second major research question t-tests were run. No one from the respondents (N=112) held a doctoral degree. Therefore only two groups were examined, those who held a bachelor's degree and those who held a master's degree. Results indicated that there were no significant differences between the family and consumer sciences secondary school teachers' knowledge, ability, and feelings when compared to their level of education. Because there were no significant differences a pooled variance estimate was recorded. However, there were significant differences between family and consumer sciences secondary school teachers' interests when compared to their education. Those who held a master's degree indicated a higher level of interest than those who held only a bachelor's degree. In this case, because there were significant differences a separate variance estimate was recorded (see Table 5).

Table 5. T-test: Knowledge, ability, interests, and feelings by highest degree held

Variable	Groups	Mean	SD	t-val	2-tail prob.
KNOWLEDGE					
	BACHEL.	2.11	0.62	.97	0.33
	MASTER	2.24	0.77		
ABILITY					
	BACHEL.	2.50	0.83	.04	0.97
	MASTER	2.51	0.99		
INTERESTS					
	BACHEL.	3.78	0.76	2.35*	0.02
	MASTER	4.06	0.50		
FEELINGS					
	BACHEL.	3.05	0.44	1.46	0.15
	MASTER	3.19	0.49		

*p£.05

Using family and consumer sciences competencies found in the Iowa Department of Education vocational education program management guide, teachers were asked to indicate their beliefs from strongly disbelieve (1) to strongly believe (5) as to whether family and consumer sciences competencies could be taught via an interactive teleteaching classroom with one or two remote sites. Family and consumer sciences competencies were grouped into seven subunits: a) housing and home management (11 items), b) food and nutrition (10 items), c) individual/family health (8 items), d) family living and parenthood (18 items), e) consumer education (5 items), f) textiles and clothing (11 items), and g) child development (13 items). The core competencies (leadership, job getting/job keeping, entrepreneurship) were a separate subunit (3 items). Item means and standard deviations for each competency are indicated in Table 2. The means ranged from 2.16 to 4.20 for all the listed competencies. An overall mean score was computed for each of the seven subunits: housing and home management (3.78), food and nutrition (3.21), individual/family health (3.96), family living and parenthood (3.82), consumer education (3.99), textiles and clothing (3.39), child development (3.88), core competency subunit (3.55). Most of the item means and the overall mean scores indicated that teachers were undecided about whether family and consumer sciences could be taught via an interactive teleteaching classroom with no more than two remote sites (see Table 6).

Table 6. Descriptive statistics (means and standard deviations) in each variable for FCS competencies and Core competencies

Characteristic	Mean	SD
HOUSING AND HOME MANAGEMENT		
Identify recent trends in housing	4.13	0.60
Explain basic financial and legal aspects of housing in various demographic situations	4.03	0.76
Examine home furnishings-home management related occupations	4.03	0.76
Identify procedures in planning for expenses, saving and managing finances	3.92	0.85
Evaluate housing alternatives	3.90	0.75
Examine design principles and elements	3.83	0.81
Locate and/or utilize home furnishings and equipment resources	3.79	0.76
Identify qualities of home furnishings and appliances	3.76	0.87
Demonstrate safety, sanitation, security, and first aid procedures	3.63	0.94
Apply the principles of management in the home	3.45	0.91
Use equipment and supplies with proper procedures	3.16	1.05
FOOD AND NUTRITION		
Examine food related occupations	4.23	0.67
Locate and/or utilize food and nutrition resources	3.96	0.73
Identify various cultural and regional cuisines	3.90	0.84

Table 6. (cont.)

Characteristic	Mean	SD
FOOD AND NUTRITION		
Analyze fad diets and eating disorders	3.89	0.83
Analyze nutritional needs and select foods for good health throughout life	3.66	1.00
Plan menus, prepare shopping list and purchase food	2.94	1.19
Apply the principles of sanitation, recycling and safety when working with food and equipment	2.68	1.32
Utilize basic kitchen skills in food preparation and storage	2.40	1.16
Prepare foods from the basic food groups	2.30	1.07
Plan, prepare, serve and evaluate a meal	2.16	1.09
INDIVIDUAL/FAMILY HEALTH		
Examine family/individual health related occupations	4.20	0.67
Identify the needs and concerns of populations with special needs	4.00	0.73
Locate and/or utilize family/ individual health resources	3.99	0.84
Evaluate consumer health options	3.98	0.77
Explain the basic skills necessary to maintain personal, physical, and mental health	3.95	0.76
Describe procedures for prevention and control of diseases	3.92	0.79
INDIVIDUAL/FAMILY HEALTH		
Identify substance abuse, use and non-use	3.86	0.86
Identify personal safety and survival skills	3.85	0.86
FAMILY LIVING AND PARENTHOOD		
Examine family living/ parenthood occupations	4.09	0.73
Examine various child care options	4.01	0.76
Identify sex-role stereotyping and means of dealing with them	4.01	0.68
Identify types of sexual abuse and sexual harassment, and intervention options	3.99	0.74
Identify risks of sexual activity	3.98	0.75
Identify various family patterns and lifestyles	3.97	0.76
Identify the ways to balance work, family and individual needs	3.92	0.75
Locate/utilize family living and parenthood resources	3.89	0.86
Describe the physical, social, emotional, intellectual development that occurs during childhood through adulthood including individuals with special needs	3.89	0.79
Describe ways to strengthen family relationships	3.82	0.79
Identify ways to deal with peer pressure	3.81	0.80
FAMILY LIVING AND PARENTHOOD	3.82	
Describe ways to build good interpersonal relationships with others	3.79	0.80
Locate/utilize resources for populations with special needs	3.75	0.82
Analyze strategies for developing a positive self concept	3.72	0.90
Develop short and long-term planning, goal-setting and decision making skills	3.63	0.97
Develop problem-solving techniques	3.58	0.97
Demonstrate alternative ways of effective communications	3.52	1.09
Identify and demonstrate response to family problems and crisis	3.51	0.92
CONSUMER EDUCATION	3.99	
Identify consumer rights and responsibilities	4.13	0.65
Examine consumer education related occupations	4.12	0.78
Locate and/or utilize consumer education resources for assistance	3.94	0.87
Determine the decision-making process in planning for expenses, savings and managing finances	3.90	0.80
Evaluate advertising, warranties, written contracts and quality of goods and equipment	3.84	0.97

Table 6. (cont.)

Characteristic	Mean	SD
TEXTILES AND CLOTHING	3.39	
Examine textiles and clothing related occupations	4.10	0.83
Locate and/or utilize textiles and clothing resources for assistance	3.87	0.93
Describe cleaning and storage methods	3.73	0.91
Recognize the relationship between appearance and self concept	3.71	0.94
Identify elements and principles of clothing design	3.68	0.91
Evaluate clothing and accessory purchases	3.60	1.01
Plan a wardrobe and prepare a clothing budget	3.35	1.12
Demonstrate repair, alteration and recycling methods	2.96	1.15
Identify fabrics, fabric construction, finishes and care	2.94	0.99
Demonstrate use and care of sewing machine and equipment in a safe manner	2.76	1.17
Follow preparation procedures for constructing and evaluating agarment project	2.69	1.15
CHILD DEVELOPMENT	3.88	
Examine child development related occupations	4.15	0.70
Discuss childhood diseases and immunization procedures	4.03	0.76
Identify the additional risks of teen pregnancy and parenting	4.00	0.82
Identify types of child abuse, neglect and intervention options	3.97	0.78
Discuss health concerns and neglect and intervention options needs at various stages of prenatal and postnatal development	3.94	0.80
Locate and/or utilize child development resources for assistance	3.93	0.94
Describe sexual reproduction and birthing process	3.93	0.85
Identify ways to provide a safe environment for a child	3.92	0.85
Describe ways to guide the physical, social, emotional, and intellectual development of children including those with special needs	3.87	0.91
Examine parenting responsibilities	3.87	0.90
Analyze contraception and family planning methods	3.79	0.90
Select toys, equipment, food and materials appropriate for the development stage of a child	3.55	1.04
Select and use appropriate child guidance techniques	3.53	1.06
CORE COMPETENCIES	3.55	
Entrepreneurship competencies	3.68	0.98
Job getting, job keeping competencies	3.66	0.93
Leadership competencies	3.32	1.10

A reliability test was run for the family and consumer sciences teachers' beliefs to determine their internal consistency. The overall reliability test produced a coefficient alpha of 0.98. The reliability test for housing and home management produced a coefficient alpha of 0.88. For food and nutrition the coefficient alpha was 0.84. For individual/family health the coefficient was 0.92. The family living and parenthood subunit had a coefficient of 0.95. For consumer education the coefficient alpha was 0.85. For textiles and clothing the coefficient alpha was 0.88. The child development subunit had a coefficient of 0.95. The core competency subunit had a coefficient alpha of 0.89.

One-way analysis of variance (ANOVA) was run to test this third major research question. Due to the small number of respondents in four categories (1 to 5, 6 to 10, 21 to 30 and 31 or more years) of the five, three main categories were reproduced for the statistical purposes: 1 to 10 years, 11 to 20, and 21 or more. One-way analysis of variance (ANOVA) revealed that there were no significant differences among family and consumer sciences secondary school teachers' beliefs when compared to their years of experience (see Table 7).

Table 7.ANOVA: Effect of years as an educator[a] on beliefs

Variable	Source	Mean square	F value	Sig. of F
BELIEFS				
	Between GR.	0.351	1.139	0.323
	Within GR.	0.308		

p£.05.

[a]Groups are: 1-10, 11-20, and 21 or more

To examine the fourth major research question a t-test was run. No one from the respondents (N=112) held a doctoral degree; therefore only two groups were examined, those who held only a bachelor's degree and those who held a master's degree. Results indicated that there were no significant differences between family and consumer sciences secondary school teachers' beliefs relative to interactive teleteaching using curriculum competencies when compared to their education (highest degree held). The level of significance selected for both analysis of variance and t-test was 0.05. Because there were no significant differences a pooled variance estimate was recorded (see table 8).

Table 8. T-test: Beliefs by highest degree held

Variable	Groups	Mean	SD	t-val.	2-tail prob.
BELIEFS					
	BACHEL.	3.65	0.55	1.58	0.12
	MASTER	3.83	0.56		

p£.05.

Summary and Conclusions

The purpose of this study was to identify the family and consumer sciences secondary school teachers' knowledge, ability, interests, feelings, and teaching preferences toward the use of interactive distance education technology. The study was descriptive in nature and involved the use of 250 mailed questionnaires. A total of 112 usable responses were returned. From the analysis of the data, the following conclusions are offered:

1. At the time of the study approximately 50% of the participants had not attended any formal presentation on interactive teleteaching.
2. The majority of the participants (30%) had learned to use teleteaching from other teachers followed by in-service (29%).
3. The majority of the participants (88%) preferred to learn about and improve their skills in the teleteaching classroom through in-service followed by other teachers (86%).
4. Almost two-thirds of the participants (60%) preferred to teach with one or two sites followed by three to five (22%). More than two-thirds of the participants (68%) preferred team-teaching.
5. Participants' knowledge of interactive teleteaching technology was very little.
6. Participants' ability to perform their teaching role in an interactive teleteaching environment was inadequate.
7. Participants' interest in using prepared teleteaching materials and collaborating with professionals within and outside their discipline was unknown.
8. Participants' feelings about family and consumer sciences courses and interactive teleteaching instructional techniques indicated a neutral reaction.
9. Participants' years of experience (years as an educator) does not have an effect on their knowledge, ability, interests, and feelings as related to interactive teleteaching techniques..
10. Participants' education (highest degree held) does not have an effect on their knowledge, ability, and feelings. It does have an effect on their interests.
11. Participants were undecided whether family and consumer sciences competencies could be taught via an interactive teleteaching classroom.
12. Participants' years of experience does not have an effect on their beliefs of whether curriculum competencies can be taught via an interactive teleteaching classroom.
13. Participants' educational level does not have an effect on their beliefs of whether curriculum competencies can be taught via an interactive teleteaching classroom.

BEST COPY AVAILABLE

In a cross examination of research studies, results of this study support the findings of the Torrie and Miller (1996) study on three facts: a) both family and consumer sciences and vocational teachers knowledge relative to interactive teleteaching was limited; b) family and consumer sciences and vocational teachers ability to perform their teaching role in an interactive teleteaching environment was limited; c) family and consumer sciences and vocational teachers prefer to learn through in service and from other teachers. Also findings of this study support the findings of Torrie and Hausafus (1996) on the fact that family and consumer sciences and health teachers' knowledge relative to interactive teleteaching technology was limited. However, results of this study contradict findings of the Torrie and Miller (1996) study on the fact that vocational teachers believed that core competencies could be taught via an interactive teleteaching classroom with no more than two remote sites.

From the results of this study, it is apparent that family and consumer sciences secondary school teachers need to obtain more information about the interactive teleteaching technology. Also, it is apparent that teachers are willing to learn about teleteaching through in-service and from other teachers. Because teachers are willing to learn about teleteaching through in-service and from other teachers, additional training and collaboration among them may be an effective process.

Results of this study can be used by family and consumer sciences teacher educators and curriculum specialists who are challenged to develop new curriculum programs appropriate for interactive teleteaching.

References

Anderson, M. (1996). Distance education: Operational issues. In C. Sorensen, C. Schlosser, M. Anderson & M. Simonson (Eds.), Encyclopedia of distance education research in Iowa (revised edition). Ames, IA: Iowa State University.

Collins, B., Veen, W. & De Vries, P. (1993). Preparing for an interconnected future: Policy options for telecommunications in education. Educational Technology, 33(1), 17-24.

Iowa Department of Education (1993). Vocational technical education: Program management guide. Iowa Department of Education.

Iowa Public Television (1996, April). Iowa database. http://www.iptv.org/iowa_database/

Stewart, D. (1996). Computers and technology in family and consumer sciences education. In S. Redick (Eds.), Family and consumer sciences education: Review and synthesis of family and consumer sciences education research 1985-1995. Peoria, IL: Glencoe/McGraw-Hill.

Torrie, M. & Hausafus, C. (1996). Utilizing distance education to deliver secondary school HIV/AIDS education. In C. Sorensen, C. Schlosser, M. Anderson & M. Simonson (Eds.), Encyclopedia of distance education research in Iowa (revised edition). Ames, IA: Iowa State University.

Torrie, M. & Miller W. (1996). An assessment of Iowa secondary vocational teachers' attitudes toward using interactive distance education strategies to support competency-based curriculum reform efforts. In C. Sorensen, C. Schlosser, M. Anderson & M. Simonson (Eds.), Encyclopedia of distance education research in Iowa (revised edition). Ames, IA: Iowa State University.

United States Congress, Office of Technology Assessment (1989). Linking for learning: A new course for education. (OTA-SET-430). Washington, DC: United States Government Printing Office.

Development of Design Guiding Principles For Constructivist-Based Distance Learning Environments

Mary Herring
Iowa State University

Introduction

K-12 teachers are struggling to design effective learning environments that meet the future needs of their students. A number of individuals have suggested that a relatively new theory of learning, constructivism, supports visions of the 21st century, technology-rich, classrooms. The role of technology in the learning process has steadily increased as access has opened classrooms to the world providing teachers and students with expanding learning opportunities. The advent of increased access to world-linking technology has increased the use of distance education to enrich and expand the learning landscape for students. To support and facilitate teachers responses to these changes in their classrooms, this project sought to identify a core of instructional design guiding principles for constructivist based distance learning environments. A panel of knowledgeable individuals in the areas of constructivism and technologically mediated education participated in an electronic study. The information produced by the study will be used to further identify designs, examples, and elements for teacher will be available for planning of inservice experiences and mentoring processes in the future.

Constructivism and Technology

Discussions about the appropriate role of technology in the learning process have increasingly stressed a theory of learning: constructivism (see e.g., Duffy, Lowyck, & Jonassen, 1993; Jonassen, 1996; Wilson, 1996). Constructivism focuses on the personal development of knowledge and learning; it describes both what knowing is and how one comes to know. Students are engaged in learning tasks that allow them to self select learning paths. As they move down their paths, they attempt to make sense of new information and experiences by transforming and organizing encounters in relation to their own knowledge bases. Teachers serve as learning facilitators for the students, providing feedback and guidance during the learning process. As much as possible, the learning environment replicates authentic and legitimate work, providing students with opportunities to learn within settings connected to the world outside school (Sheingold,1991). The relevance of these settings is thought to provide motivation because the student perceives them as real instead of the artificial memorizing of inert bits of knowledge. The focus is on the construction of personal knowledge in a context similar to that in which the knowledge will be applied (Savery & Duffy, 1996). When something is being constructed, the tools to support that construction become important.

Technology is one of the tools impacting society and, as such, education. As one looks towards the contexts that will evolve in the 21st century, there is little doubt that technology will play a key role. Peck and Dorricott (1994) suggest several reasons for the use of technology in the school setting:

1. Students need access to high level and high-interest courses.
2. Schools need to increase their productivity and efficiency
3. Graduates must be globally aware and able to use resources that exist outside of school.

As it is increasingly accessible, distance education, a combination of technology and education, can help educators to meet these needs. State-mandated curriculum reform efforts, particularly increased high school graduation or college admission requirements, are driving many efforts towards distance education due to two factors: (a) Specific educational needs can be met, and (b) Recent rapid development of technology has resulted in systems that are increasingly affordable (Office of Technology Assessment, 1989). Distance learning networks have become important due to their ability to expand both the classroom and access to the available learning resources.

In the past, distance education was conceptualized as an industrialized form of education with instructional materials packaged for the purpose of delivering instruction to a remote learner (Keegan, 1986, p. 47). Today, emerging technology, with its increased bandwidth, interactivity, and accessibility, is opening numerous opportunities for students, teachers, and information to interactively mesh in the construction of knowledge. Emerging technology is allowing a reconceptualization of the concept of distance education. Innovative types of pedagogy enabled by these emerging media, messages, and experiences make possible a transformation of conventional distance education (i.e., replicating traditional classroom education) into alternative instructional paradigms (Dede, 1995). Methods used to optimize instruction by tailoring content to the communications characteristics of the medium are important issues under discussion (See e.g., Mehlinger, 1996; ONeil, 1995; Sheingold, 1991). To acknowledge that both learning and teaching are under scrutiny, Sheingold (1991) labels the discussion as an approach to active learning and adventurous teaching (p. 19).

Much time and effort has been spent defining and discussing constructivism (See e.g., Duffy & Jonassen, 1992; Duffy, Lowyck, & Jonassen, 1993; Wilson, 1996) and technologically mediated education, of which distance education is a key component (See e.g., Dede, 1991; Willis, 1994; Portway & Lane, 1994). Little discussion has addressed the combination of the two entities, or the skills teachers may need to implement their combination, into a constructivist based distance education program. This study brought together experts in constructivism and technologically mediated learning for the purpose of developing a set of design guiding principles to be used, in a later study, to identify the elements a teacher must possess to responsively create, facilitate, and evaluate these learning environments.

Method

Research Design

The purpose of this study was to identify a set of design guiding principles for constructivist based distance learning environments. A panel of 14 knowledgeable individuals in the areas of constructivism and educational technology agreed to participate. Respondents provided input via instruments located on a WWW site. Three constructivist propositions were used to guide the development of the necessary WWW pages for the study (Savery & Duffy, 1996, p. 135):

> 1. Understanding is in our interactions with the environment. Because understanding is a function of interaction of the content, context, the activity, and the individual a context was created to serve as a vehicle for the study. The School District #627 Instructional Support Project was identified as a fictitious project to develop an outline of the necessary knowledge and skills for teachers to design and implement constructivist based learning environments in schools without walls, a virtual school district.

2. Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned. The placement of the panel within the project context provided the purpose for the study. The identification of the knowledge and skills provided the stimulus for knowledge construction.

> 3. Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings. The social environment of the study and the use of the WWW provided the panel with opportunities to see and respond to each others anonymous responses. The iterations of the study allowed the negotiation of the construction of the final product of the study.

Findings from the study will be answer following question: Can a series of design guiding principles be identified to assist teachers in the creation, facilitation, and assessment of constructivist-based, interactive, distance learning environments?

Panel Membership

Panel members for this study were chosen from the following areas of expertise: (a) Constructivism; (b) Technologically-Mediated Education; (c) Instructional Design; (d) Learning Environment Design; and (d) Virtual Environments. Identification came from four sources: a conference proceedings search, an ERIC search, a library search, and conversations with recognized leaders in the fields. From these searches, 23 individuals were identified. Fourteen people agreed to participate. Thirteen of the panel members were from a university setting, one was from private business.

Instrument

All instruments were available on the School District #627 Instructional Support Project World Wide Web site. A previously expressed concern about formatting problems during an electronic-mail based research study (Bell, 1992) and a concern about ease of replying, lead the researcher to the use of the World Wide Web. The WWW was chosen because: (a) it can be designed to provide a simplified interactive environment thought to encourage input from the panel; (b) it provides a more standardized format for viewing the pages; (c) it has the ability to hyperlink pages which facilitates the setting of the context and connections to support documents; and because (d) it allows the flexibility of adding follow-up iterations while still maintaining previous ones for the panel members edification.

A concern noted in the planning of this project was the possibility that outsiders to respond to the Delphi and confound the study. A WWW grading program, Classnet (Boysen & Van Gorp, 1996), was incorporated into the

BEST COPY AVAILABLE

project to guarantee anonymity and reception of only authorized responses. Classnet requires an alias before answers can be submitted, thus outside interference was eliminated.

The context provided was the fictitious School District #627 Instructional Support Project. The School District #627 Instructional Support Project scenario was explained as follows: For the first time in its history, K-12 School District #627 is able to preplan all components for a student's educational experience. The results of the project will be used to guide inservice activities for the districts teachers. Over the last 3 years, the city served by School District #627 has been wired for interactivity with a fiber optic system called the Virtual Network (VN). As the city began planning for the VN, the school district began planning for their transition to a school district without walls—a virtual school district. The district has access to and the financial resources for use of any type of distance technology they choose. T here are no limits on the resources (technological or otherwise) available; the only parameter is that the learning setting offer interactivity to its participants. After a series of meetings with educational stakeholders and learning consultants, the district has selected constructivism as the philosophical foundation for learning in the new classrooms (Herring, 1996). The intent of the context was to frame the discussion, and yet, leave it open to the areas of expertise of the panel members. The scenario was left broad enough to allow visioning for future technology (i.e., any type of distance technology) while clearly situating the discussion in a K-12 constructivist based learning environment.

Almost all communication was carried out via the computer, using email and the WWW. Phase One of the Delphi provided for the social negotiation of the design guiding principles. The Constant Comparison method, which grounds the final product (in this case, the final set of designs or examples and their elements of implementation) in the joint constructions of the respondents, was used to guide the development of the instruments for phases two and three responses. The joint construction emerges as the panel moves towards consensus on the final product through the iterations of the Delphi (Guba & Lincoln, 1989). Thus, the final product is grounded in the individual responses of each panel member.

The Study

Phase One

For the first round, several pages were put on the web site. A graphic interface opened the site, allowing quick movement to other pages; an introductory page set the context for the Instructional Support Project; and a Delphi/Definitions page offered clarification of the research process and terms. The Phase One instrument offered five design guiding principles for constructivist based distance learning environments for review and comment by the panel. The five principles were developed using tenets of constructivism that were established through a review of 14 constructivist based articles. Panelists were notified of the project start through email. Email reminders were sent out twice during this phase.

The five original principles were:
Design Guiding Principle 1: Anchor instruction using authentic problems and simulations that have relevance or can become relevant for students and that actively engage students in the design of knowledge.
Design Guiding Principle 2: Encourage students to collaborate during the learning process, thus providing the opportunity for increasing students' favorable attitude towards the importance of visiting content and problems from multiple perspectives.
Design Guiding Principle 3: Grant students responsibility for the learning process and for creating understanding; seek and value students' points of view and experiential backgrounds in developing or creating dynamic, challenging learning environments appropriate for the student's level of expertise.
Design Guiding Principle 4: Promote student reflection about both the content learned and the learning process by incorporating individual and collaborative feedback during student articulation, presentation, and revision of ideas.
Design Guiding Principle 5: Make assessment dynamic, evolving from students' use of the competencies and reasoning processes that address the goals of the learning environment, while locating it in authentic contexts and integrating it into the instructional design so that the assessment is embedded in the instructional process.

Phase 2

In Phase Two the original principles were reordered and rewritten to reflect input from the panel. Phase Two WWW additions contained pages with panel members responses to Phase One, justification for changes to the five principles, and the Phase Two instruments. A general comment box was added at the request of several panel members. The design guiding principles were revised to reflect panelists input. Following is a listing of the five principles and an explanation of the changes:

Principle 1: Given an understanding of and positive attitude towards constructivism: Provide learning experiences which promote student reflexivity about both the content learned and the learning process in order to develop the student's self-awareness of the constructedness of knowledge and the student's self-control over the learning process.

Explanation of change: The original Design Guiding PrincipleFour was moved to the first position because several responded identified that it addressed the basis of constructivism: metacognition. A term from Cunningham, Duffy, and Knuth (1991) reflexivity (i.e., a reflection of our reflections, thinking about our thinking process, knowing how we know), instead of the term multiple perspectives, was used because it was provided an expanded definition of intent of the learning process. Several respondents identified this principle as critical aspect, essential component, and heart of it which also made the move to #1 appropriate.

Design Guiding Principle Two: Create dynamic, challenging learning environments which are appropriate for the student's level of expertise, development, and culture and which encourage, facilitate, and support student's taking ownership of the learning process.

Explanation: Principle Two takes into account the learner in the design of the learning environment. Since constructivists identify that knowledge construction is a function of ones prior experiences, mental structures, and beliefs that are used to interpret object and events (Marra & Jonassen), the learner must be an early and integral piece in the design and implementation of learning environments. The wording was changed because panelists felt the wording targeted increasing students favorable attitudes rather than the importance of multiple perspectives. Social negotiation of knowledge was used to be more encompassing including not only multiple perspectives but identified topics such as collaboration.

Design Guiding Principle Three: Given a relatively defined domain of knowledge and learning goals, design authentic instruction situations that have relevance or, through teacher mediation, can become relevant to students and that actively engage students in the construction of transferable meaning.

Explanation: Principle Three addresses the need to create learning environments in a context that the student would see as potentially creating useable (i.e. transferable) knowledge. Because the learners come to the environment at varying levels from novice to expert, it was identified that the opportunity for teacher mediation should be included. Several respondents found that the original principle seemed to address multiculturalism rather than learning environments where students can move about in their own learning levels so wording was restructured to focus on students entry level rather than ethnic diversity. A number of respondents mentioned the need to address the role of the instructor as the facilitator of learning, thus in Principle Two (encourage, facilitate, and support) and in Principle Three (through teacher mediation) wording was changed to reflect a more appropriate role for the instructor.

Design Guiding Principle Four: Develop learning experiences which encourage the social negotiation of knowledge to provide learners with the opportunity to evaluate individual understandings of concepts and to expand individual and shared understandings.

Explanation: Principle Four speaks to the importance of interactions within the environment. The interactions would naturally occur after the relevancy of the learning was identified by the students. The original Principle Two (the new Principle Four) wording was identified as targeting increasing students favorable attitudes rather than the importance of multiple perspectives. The social negotiation of knowledge replaced increasing students favorable attitudes, to be more encompassing including not only multiple perspectives but topics such as collaboration and others. Both cognitive constructivist and sociocultural constructivists address this issue as important (Fosnot, 1996).

Design Guiding Principle 5: Given an understanding of and positive attitude towards constructivism: Use dynamic, authentic assessment that is embedded in the instructional process to assess both student learning and the learning environment.

Explanation: Principle Five deals with assessment. Constructivist believe that assessment of learning should evolve out of the learning process through the negotiation between student and teacher thus, it would be logical to have it follow principles dealing with the learning environment creation and students learning activities. The intention of setting goals was moved from Principle Five to Principle Three because goals support the creation of the learning environment. Thus, they should be mentioned earlier in the principles, thereby, becoming embedded in the assessment of the learning process. Several identified that some of the principles were how to while others were not, so I have attempted to put them all in the same format using action verbs to indicate their use rather than giving instructions on their implementation.

Conclusion

The intent of this project was to identify a set of design guiding principles using a panel of knowledgeable individuals in the areas of constructivism and/or distance learning. Following a two phase project, five final principles were agreed upon. The principles represent a beginning to the combination of constructivist based learning theory and distance education. They provide a foundation that can be used for the further identification of the knowledge a teacher should have to create, facilitate, and assess constructivist based, interactive distance learning environments.

BEST COPY AVAILABLE

From fiber optic networks to the World Wide Web, the interactive nature of new distance learning technologies provides students and instructors with technologies that are intended to be flexible, explorative and open to social uses and whose potentially rich sources of data will be readily available in response to the demands of the learners functioning within an open environment. Their availability for use in life contexts can change the way we work, think, do, and learn substantially.

To respond to the future needs of students, the design of distance educations use should be focused on social interactions and communication; intended to support the social, distributed and situated construction of new knowledge. The development of constructivist based distance learning environments can embody this design. The design will not occur simply ecause instructors have access to the new technology. Instructors must be introduced to the nuances of integrating new ways of constructing learning with the new more powerful distance settings to provide students with the tools necessary for effective participation in the 21st century. Mehlinger (1996) creates a succinct picture of the imminence of technologies impact: If you believe that schools are part of the American culture, that the American culture is increasingly influenced by Information Age technology, and that teachers participate in the American culture as much as other Americans, then you cannot also believe that teachers will use the technology outside of school but fail to employ it in their classrooms. Technology will be used extensively in schools. That much is inevitable (p. 407).

Considering the nature of distance education, with students expected to shoulder more of the responsibility for learning, and the capacity of emerging technology, with its increased capacity to support learning, the marriage of constructivism and distance education seems a likely fit.

Bibliography

Boysen, P. & Van Gorp, M. (1996). Personal conversation.

Dede, C. (1991). Emerging technologies: Impacts on distance learning. Annals of the American Academy for Political and Social Science, 514 (March), 146-158.

Dede, C. (1995). The transformation of distance education to distributed learning. Unpublished manuscript.

Duffy, T. M. & Jonassen, D.H. (1992). Constructivism and the technology of instruction. Hillsdale, NJ: Lawrence Erlbaum Associates.

Duffy, T.M., Lowyck, J., & Jonassen, D.H. (Eds.) (1993). Designing environments for constructive learning. Berlin: Springer Verlag.

Fosnot, C. T. (1996). Constructivism: Theory, perspectives, and practice. New York: Teachers College Press.

Guba, E. G. & Lincoln, Y.S. (1989). Fourth generation evaluation. Newbury Park, CA: Sage Publications, Inc.

Herring, M. (1996). Introduction. School District #627 Instructional Support Project. Available: http://www.public.iastate.edu/!mherring/intro.html

Jonassen, D. H. (1996). Computers in the classroom: Mindtools for critical thinking. Englewood Cliffs, NJ: Merrill.

Keegan, D. (1986). The foundations of distance education. London: Croom

Helm. Marra, R. M. & Jonassen, D. H. (1993). Wither Constructivism. Educational Media and Technology Yearbook.

Mehlinger, H. D. (1996). School reform in the information age. Phi Delta Kappan, 77(6), p. 400-407.

Office of Technology Assessment (1995). Teachers and technology: Making the connection. Washington, DC: Government Printing Office.

Office of Technology Assessment (1989).Linking for learning: A new course for education. Washington, DC: U.S. Government Printing Office.

ONeil, J. (1995). On technology and schools: A conversation with Chris Dede. Educational Leadership, 53(2), 6-13.

Peck, K.L. & Dorricott, D. (1994). Why use technology? Educational Leadership, 51(7), 11-14).

Savery, J. R. & Duffy, T.M. (1996). Problem based learning: An instructional model and its constructivist framework. In B. Wilson. (Ed.) (1995). Constructivist leaning environments: Case studies in instructional design. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan, 73 (1), 17-27.

Willis, B. (Ed) (1994). Distance Education Strategy and Tools. Englewood Cliffs, NJ: Educational Technology Publications.

Wilson, B. (Ed.) (1996). Constructivist leaning environments: Case studies in instructional design.Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Usefulness of the Iowa Communications Network for Delivering Instruction in Secondary Agriculture Programs

Greg Miller
Iowa State University

Introduction

In the book Understanding Agriculture, the National Research Council (1988) maintained that for agricultural education to grow and prosper, educators should borrow from the best current programs while creating new ways to deliver agricultural education. The implementation and spread of distance education technology may represent one way to answer this challenge. Distance education offers a viable opportunity for agricultural educators to battle declining enrollments, increased graduation requirements, decreased funding, and changing clientele. Distance learning provides students with opportunities to enroll in courses they may not have had the opportunity to experience previously and allows schools to offer subjects for which they have no qualified instructors (Swan, 1992). If distance education technology is such a powerful instructional tool, why aren't more teachers, particularly agriculture teachers, utilizing this technology?

Faculty resistance is often listed as the major barrier keeping distance education technologies from being implemented (Dillon & Walsh, 1992). Negative teacher attitudes, additional workloads, lack of funding, reduced student interaction, lack of time, and technical problems have all been identified as obstacles to the adoption of distance education technologies (Dillon & Walsh, 1992; Hansford & Baker, 1990; Jackson & Bowen, 1993; Jurasek, 1993). However, the same researchers found that faculty with distance teaching experience generally had more positive attitudes toward technology-mediated instruction. What attitudes are currently held by secondary agriculture teachers in Iowa toward telecommunicated instruction, and what obstacles do they perceive to be most inhibiting to the use of the Iowa Communications Network (ICN), the state's two-way interactive fiber optic network?

As the field of agriculture continues to develop rapidly, agricultural education programs must keep pace. Distance education technologies may be able to facilitate the modernization and improvement of secondary agriculture programs. Several curriculum initiatives in agricultural education are currently being promoted. Which curriculum initiatives are perceived to be priority areas by secondary agricultural education teachers? Can certain priority initiatives be accelerated through distance education? What courses can agriculture teachers offer through the ICN to schools that currently do not have agriculture programs? A need exists to identify priorities for agricultural distance education related to specific courses and units of instruction suitable for delivery via the ICN.

Purpose and Objectives

The purpose of this descriptive study was to investigate the usefulness of the ICN for agricultural education at the secondary level. The specific objectives were to:

1. Describe obstacles that may inhibit use of the ICN by secondary agriculture teachers.

2. Describe secondary agriculture teachers' attitudes toward using the ICN for delivering agriculture instruction to youth and adults.

3. Identify priorities for collaboration among secondary agriculture programs in delivering instruction over the ICN.

4. Identify courses offered in secondary agriculture programs that are suitable or unsuitable for delivery via the ICN.

Procedures

Population and Sample

The population for the study consisted of all secondary agriculture teachers in Iowa (N=216). The frame for the study was developed from lists supplied by the Iowa Bureau of Career Education and the Agricultural Education and Studies Department at Iowa State University. The lists were cross-referenced to minimize frame error. Based on Krejcie and Morgan's (1970) formula for a five percent margin of error, a random sample of 140 teachers was drawn.

Instrumentation

The questionnaire used in the study consisted of four parts including attitude toward using the ICN, obstacles that may inhibit use of the ICN, priorities for collaboration and course offerings, and selected demographic questions. Content and face validity for the questionnaire were established by a panel of experts in agricultural education.

Obstacles that may inhibit the use of the ICN by secondary agriculture teachers were identified by interviewing persons responsible for administering different aspects of the ICN, agriculture teachers not included in the sample, and from an instrument used by Swan (1992) for a similar purpose in North Dakota. Likert-type response categories for the 16-items ranged from insignificant (1) to significant (6). Teacher attitude toward the ICN was measured with 28-items using a Likert-type scale with five response categories ranging from strongly disagree (1) to strongly agree (5). Both instruments were tested for suitability and reliability with a group of 10 secondary agriculture teachers not included in the sample. Cronbach's alpha was used to estimate the internal consistency of the instruments. The reliability coefficients were .82 for the obstacles scale and .93 for the attitude scale.

Data Collection

Data were collected by mailed questionnaire. The questionnaire, along with a cover letter and a stamped return envelope, was sent to all secondary agriculture teachers included in the sample. After 10 days, a second mailing was sent to all non-respondents. Ten days after the second complete package was mailed, a reminder letter was sent to all non-respondents stressing the importance of their participation. Approximately 10 days after mailing the reminder letter, telephone calls were made to the non-respondents. One-hundred and two teachers completed and returned the questionnaire for a response rate of 73 percent. Non-response error was controlled by comparing early to late respondents (Miller & Smith, 1983). No significant differences were found between early and late respondents.

Results

The agricultural educators who participated in the study ranged in age from 23 to 64 years. The mean age of respondents was 37 with a standard deviation of 9.50. Ninety-two (90.2%) of the respondents were male.

The agricultural education teachers were asked to report their highest level of education. Bachelor's degrees were held by 71 percent (n=66) of the teachers, 27 percent (25) held masters degrees, and 2 percent (2) held doctoral degrees. The agricultural education teachers also were asked to indicate the number of years they had taught agricultural education and whether or not they had tenure. Years of experience ranged from 1 to 35, with a mean of 12.44 and a standard deviation of 8.51. Approximately, three-quarters (77) of the teachers had tenure in their current positions.

The teachers were asked if their school was currently connected to the ICN. They were also asked if they had ever taught or taken a class via the ICN. At the time of this study, 23 percent (22) of the schools represented by the agriculture teachers were connected to the ICN. None of the agriculture teachers had taught using this technology. Nine teachers (8.8%) indicated that they had taken at least one course via the ICN.

The teachers responded to sixteen statements representing obstacles which might inhibit their use of the ICN. A Likert-type scale with response categories ranging from insignificant (1) to significant (6) was utilized. Table 1 shows that 48 percent (49) of the teachers provided a mean score in the range of 4.51 to 5.50 (moderately significant). Approximately 39 percent of the teachers reported mean scores in the range of 3.51 to 4.50 (slightly significant). Mean scores in the range of 1.51 to 3.50 (moderately or slightly insignificant) were reported by less than eight percent (8) of the teachers. The overall mean score for the 16 obstacles was 4.49 (slightly significant), with a standard deviation of 0.63.

Table 1. *Mean scores for obstacles that may inhibit use of the ICN by agriculture teachers*

Range of Mean Scores	Number	Percent
1.51-2.50	1	1.0
2.51-3.50	7	6.8
3.51-4.50	38	39.3
4.51-5.50	49	48.0
5.51-6.00	5	4.9
Total	102	100.0

Overall mean = 4.49 SD=0.63

Scale: 1=insignificant; 2=moderately insignificant;
3=slightly insignificant; 4=slightly significant;
5=moderately significant; 6=significant

62

Table 2 shows the percentage of teachers who selected slightly significant, moderately significant, or significant for each of the sixteen obstacles. School and class scheduling problems were considered most significant by the agriculture teachers. Lack of local support staff, the inability to conduct lab sessions, and materials distribution were each considered significant, moderately significant, or slightly significant by 87 percent of the respondents. Costs, training, and preparation time were considered obstacles by 80-85 percent of the agriculture teachers. The obstacles receiving the lowest frequency of responses in the slightly significant, moderately significant, and significant categories were lack of student interest and negative attitudes of teachers toward the ICN.

Table 2. *Percentage of teachers who selected slightly significant, moderately significant, or significant for each obstacle*

Obstacle		Percent
1	Coordination of schedules between schools	94.1
2	The ICN could create scheduling problems	88.2
3	Laboratory sessions cannot be taught via the ICN	87.3
4	Distributing materials between sites	87.3
5	Lack of local support staff	87.3
6	Supervised agricultural experiences cannot be managed via the ICN	86.3
7	Costs associated with using the ICN	85.3
8	Lack of training	83.3
9	Preparation time needed by teachers	82.4
10	Fear that the ICN would reduce the number of agriculture programs	78.4
11	Agriculture teachers are too busy to teach via the ICN	77.5
12	Lack of incentives for teaching	77.5
13	Administrators do not understand ICN teachers' needs	77.5
14	Difficulty in establishing cooperative relationships among schools	68.6
15	Negative attitude of teachers towards ICN	61.8
16	Lack of student interest	58.8

On a five-point Likert-type scale, teachers were asked to respond to 28 statements related to their attitude toward the use of the ICN to teach agriculture. Table 3 reveals that 63 percent (64) of the teachers had a mean score in the range of 2.51 to 3.50 (undecided). An additional 32% (33) of the agriculture teachers reported a mean score in the range of 3.51 to 4.50 (agree). The remaining five percent (5) of the respondents had mean scores between 1.51 and 2.50 (disagree). The overall mean score for the 28 attitudinal statements was 3.26 (undecided) with a standard deviation of 0.47.

Table 3. *Mean scores for agriculture teachers' attitude toward using the Iowa Communications Network to teach agriculture*

Mean	Number	Percent
1.51-2.50	5	4.9
2.51-3.50	64	62.7
3.51-4.50	33	32.4
Total	102	100.0

Overall mean= 3.26 SD= 0.47

Scale: 1=strongly disagree; 2=disagree; 3=undecided; 4=agree; 5=strongly agree

Agriculture teachers were asked to list units of instruction that they would like to receive from other agriculture programs through the ICN. A total of 275 units of instruction were listed by the 102 agriculture teachers participating in the study. Units of instruction were placed into 12 content-related categories by the researcher. Table 4 shows that units related to agricultural economics (25.8%) were listed most frequently as priority units for reception.

Horticulture, floriculture, and landscaping units (13.8%) were the second most frequently cited units followed by animal sciences (11.2%), agronomy (9.5%), aquaculture (9.5%), agricultural mechanics (8.3%), and biotechnology (5.5%). Categories representing less than five percent of the total number of units included natural resources and the environment, careers in agriculture, computers, and leadership/FFA (a vocational student organization)/supervised agricultural experience (SAE). Approximately six percent of the units were grouped into a miscellaneous category and included such units as forestry, food technology, international agriculture, and agricultural journalism.

Table 4. *Categories of priority units of instruction that agriculture teachers desire to receive or would be willing to deliver via the ICN*

	Receive		Deliver	
Unit	Number	Percent	Number	Percent
Agricultural Economics	71	25.8	38	23.2
Horticulture/Floriculture/Landscaping	38	13.8	14	8.5
Animal Sciences	31	11.2	42	25.6
Agronomy	26	9.5	19	11.6
Aquaculture	26	9.5	4	2.4
Agricultural Mechanics	23	8.3	12	7.3
Biotechnology	15	5.5	4	2.4
Natural Resources/Environment	13	4.7	6	3.7
Careers in Agriculture	6	2.2	4	2.4
Computers	5	1.8	5	3.1
Leadership/FFA/SAE	4	1.5	9	5.5
Miscellaneous	17	6.2	7	4.3
Total	275	100.0	164	100.0

Agriculture teachers were also asked to list units of instruction that they would be willing to teach via the ICN. A total of 164 units of instruction were listed by the 102 agriculture teachers who participated in the study. Table 4 shows that units related to animal sciences (25.6%) were listed most frequently as priority units for delivery. The second most frequently cited category was agricultural economics (23.2%) followed by agronomy (11.6%), horticulture, floriculture, and landscaping (8.5%), agricultural mechanics (7.3%), and leadership/FFA/SAE (5.5%). Categories representing less than five percent of the total number of units included natural resources and the environment, computers, careers in agriculture, biotechnology, aquaculture, and the miscellaneous category.

Due to the nature of the instruction in secondary agriculture programs, it could be hypothesized that only select course offerings are suitable for delivery via the ICN. Agriculture teachers who participated in the study were asked to list titles of courses (semester or year-long) that could be delivered via the ICN to schools without an agriculture teacher. A total of 210 course titles were listed by the agriculture teachers. The researcher collapsed the course titles into nine categories which are presented in Table 5.

Course titles related to agricultural economics (35.2%) were listed most often as courses that were suitable for delivery via ICN. The second most frequently cited category of course titles was agronomy (19.5%), followed by animal sciences (18.6%); horticulture, floriculture, and landscaping (5.7%); and natural resources and the environment (5.2%). Categories representing less than five percent of the course titles included agricultural mechanics, leadership/FFA/SAE, and aquaculture. Approximately 11 per-

Table 5. *Categories of priority courses that could be offered via the ICN to schools with no agriculture teacher*

	Suitable		Not Suitable	
Course	Number	Percent	Number	Percent
Agricultural Economics	74	35.2	9	4.8
Agronomy	41	19.5	19	10.2
Animal Sciences	39	18.6	12	6.5
Horticulture/Floriculture/Landscaping	12	5.7	30	16.1
Natural Resources/Environment	11	5.2	5	2.7
Agricultural Mechanics	6	2.9	88	47.3
Leadership/FFA/SAE	3	1.4	8	4.3
Aquaculture	1	0.5	5	2.7
Miscellaneous	23	11.0	10	5.4
Total	210	100.0	186	100.0

cent of the course titles were grouped into a miscellaneous category and included such titles as agricultural communications, Iowa agriculture, agricultural issues, and agricultural chemicals.

Agriculture teachers were also asked to list titles of courses (semester or year-long) that would be unsuitable for ICN delivery. A total of 186 course titles were listed by the agriculture teachers. Table 5 shows that agricultural mechanics courses (47.3%) were most frequently cited as not suitable for ICN delivery, followed by horticulture, floriculture, and landscaping courses (16.1%), agronomy courses (10.2%), animal science courses (6.5%), and miscellaneous course titles (5.4%). Categories representing less than five percent of the course titles included agricultural economics, natural resources and the environment, leadership/FFA/SAE, and aquaculture.

Conclusions and Recommendations

Overall, the 16 obstacles to using the ICN in secondary agriculture programs were perceived to be slightly significant. Teachers were most concerned with scheduling problems, but were also concerned that laboratory sessions and supervised agricultural experiences could not be managed over the system. Additionally, the respondents were concerned with costs, lack of training, and incentives for using the system.

Perhaps scheduling, training, and incentives are less problematic than concerns related to SAE and laboratory experiences. Can quality ICN programs in agricultural education be delivered without sacrificing the foundations (SAE and laboratory experiences) upon which agricultural education was built? It is recommended that pilot or demonstration programs be developed that include laboratory and hands-on learning experiences within the interactive distance education delivery mechanism to demonstrate viable alternatives to conventional methods of teaching agricultural education.

Data suggest that secondary agriculture teachers are undecided about using the ICN as a tool for teaching agriculture. If attitudes are a reflection of an individual's personal perspective and are strongly predictive of behavior, what does this tell us about agriculture teachers' willingness to use this technology? Perhaps Lionberger and Gwin's (1982) adoption process theory, which includes awareness, interest, evaluation, trial, and adoption, could explain the current situation. Currently the ICN is connected to less than 25 percent of the schools in Iowa that have agricultural education programs. It is recommended that teacher educators provide secondary agriculture teachers with current information related to the ICN to increase awareness and stimulate interest. Also, secondary agricultural education teachers should be provided opportunities, both as recipients and providers of distance education, to gain experience with the ICN technology. Studies in education and distance education have shown that teacher attitudes become more positive as a result of experience with technology (Rollins, 1993).

The highest priorities for collaborative efforts among schools with agriculture programs were in the areas of agricultural economics and horticulture. Teachers also cited units of instruction (aquaculture and biotechnology) that are related to current curriculum initiatives in agricultural education. Teacher educators should plan, organize, and deliver inservice education in curriculum development and strategies for lesson presentation particularly for agricultural economics and horticulture related units. The data suggest an adequate number of teachers are willing to teach units of instruction in priority areas via the ICN. Teacher educators should promote the involvement of secondary agricultural education teachers in using the system to improve programs throughout Iowa.

Interestingly, different teachers perceived the same content-related categories of courses to be both suitable and unsuitable for delivery via ICN to schools with no agriculture teacher. A clear pattern was evident regarding the suitability of agricultural mechanics courses and agricultural economics courses. Teachers generally agreed that agricultural mechanics courses were not suited to ICN delivery, but agricultural economics courses were suited to ICN delivery. Teacher educators, secondary agriculture teachers, administrators and others with an interest in agriculture should work collaboratively to facilitate the delivery of instruction in and about agriculture to schools without agriculture teachers. The teachers who participated in this study placed considerable emphasis on agricultural economics, but agronomy and animal science courses were also listed as promising areas for course delivery.

References

Dillon, C. L., & Walsh, S. M. (1992). Faculty: The neglected resource in distance education. The American Journal of Distance Education, 3(6), 5-21.

Hansford, B., & Baker, R. (1990). Evaluation of a cross-campus video teaching trial. Distance Education, 11(2), 287-307.

Jackson, G. B., & Bowen, B. E. (1993). A conceptual model for effectively planning and delivering distance education courses and programs in agriculture. Proceedings of the 20th National Agricultural Education Research Meeting, Nashville, TN.

Jurasek, K. (1993). Distance education via compressed video: An evaluation of the attitudes and perceptions of students and instructors. Unpublished masters thesis, Ames, IA: Iowa State University.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Lionberger, H. F., & Gwin, P. H. (1982). Communication strategies: A guide for agricultural change agents. Danville: The Interstate Publishers and Printers, Inc.

Miller, L., & Smith, K. (1993). Handling non-response issues. Journal of Extension, 21(5), 45-50.

National Research Council. (1988). Understanding agriculture: New directions for education. Washington, DC: National Academy Press.

Rollins, T. J. (1993). The efficacy of the adoption diffusion theory for agricultural education. Proceedings of the 20th National Agricultural Education Research Meeting, Nashville, TN.

Swan, M. K. (1992). Educational instruction via interactive video network. Unpublished paper. Fargo: North Dakota State University.

Educators Adoption of the Internet

Patricia Anne Sereg
Urbandale Community School District

Introduction

The Internet is a tool for distance education. Distance education in Iowa is defined as formal, institutionally-based educational activities where the teacher and learner are normally separated from each other in location but not normally separated in time; and where two-way, full motion interactive telecommunications systems are used to connect them for the sharing of video, data, and voice-based interaction (Simonson, 1992). According to Otto Peters "distance teaching/educating is a method of imparting knowledge, skills and attitudes which is rationalized by the application of division of labor and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialized form of teaching and learning" (Peters, 1988).

Many schools are enthusiastically connecting to the Internet in hopes of providing the global opportunities for their students and teachers. Many Iowa public schools have access to the Internet while others have plans to access the Internet in the future. As more Iowa public schools connect to the Internet, educators will be challenged to learn about and how to use the Internet. Some Iowa public educators will accept the Internet willingly, and some will resist the new technology.

Research studies indicate that personality traits, perceptions of the innovation, and organizational characteristics are important factors in the rate of adoption of an innovation (Rogers, 1994; Wangen, 1982; Jocoby, 1971; Goldsmith & Nuegent, 1984; Kirton, 1976).

Purpose of Study

The Iowa state government is providing the financial support to Iowa public schools for technological improvements. The legislative intent of the funding is to improve instructional technology in Iowa schools so that students, teachers and administrators are equipped to excel in the twenty-first century. Research is needed to provide a greater understanding of the success of technological innovations .

The purpose of this investigation was to identify and discuss issues which played an important role in shaping patterns of use, adoption and implementation of wide area networking and local area networking in Iowa public schools. This investigation examined specific characteristics of persons involved in the adoption of an innovation (the Internet) and the rate of adoption. It identified specific behaviors that related to the Internet adoption process in Iowa public schools. This study identified educators' significant perceptions of the Internet which were predictors of the rate of adoption. Iowa public educators' perceptions of administrative support and innovativeness were also identified..

Literature Review

Diffusion of Innovations Theory

Diffusion of an innovation (a new idea, practice or object) is a special type of communication process. The communication process is a two-way exchange of information about the innovation. The communication process occurs over time within a social system.

Diffusion of innovations encompasses four events in the communication process: the innovation, the communication channels, the time and the social system. "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system." (Rogers, 1995, p.11) These events are identifiable in every diffusion research study and in every diffusion program (Rogers, 1995).

Rate of Adoption

The rate of innovation adoption is the speed at which the innovation is adopted by the organization. It is measured by the length of time required for a certain percentage of members to adopt the innovation (Rogers, 1995). The rate of adoption is determined by several variables including personality traits of individuals involved, the organizational characteristics, the implementation strategies, perceptions of the innovation, and incentives.

The rate of adoption is not the same for all members of a social system. According to Rogers (1995) there are differing degrees of adoption. Some individuals may adopt an innovation earlier than others. Rogers identifies five adopter categories: 1) innovators, 2) early adopters, 3) early majority, 4) later majority, 5) laggards. Innovators are the first to try new ideas. Early adopters are highly respected within the social system and may be relied upon for advice and information about an innovation. The early majority follow with a deliberate willingness in adopting innovations, but seldom lead. The late majority approach an innovation with skepticism and caution and adopt an innovation only after most others in their social system have done so. Laggards are the last to adopt an innovation and tend to be suspicious of change agents and innovations (Rogers, 1995).

Research on Internet Use

The Internet has the potential to change the nature of learning and instruction (Kinzie, et al. 1996). One example of use of the Internet and its effects on learning is a study conducted by Kinzie et al. (1996) on the use of the Interactive Frog Dissection site located on the WWW. Kinzie(1996) collected statistics on the number of times this web site was accessed. They also collected qualitative data on the effects of the experiences of on-line frog dissection. They found that this site had been visited 166,821 times within 17 months of use. The average number of visits per week was 2,285. Each month there was an average of 6,888 visits from different users. The 430 comments collected were positive and identified the site as outstanding and very beneficial to the user's understanding.

Kinzie and her colleagues (1996) analyzed the addresses of visitors to the Frog Dissection site. They found that 81%of the site users could be tracked to the United States. Of this 81% , 36.6% were from U.S. commercial addresses, 26.6% were from U.S. educational institutions, and 10.1% were from network addresses. Requests also came from Canada (4.5%), United Kingdom (3.5%), Germany (1.8%), Australia (1.3%), Sweden (1.2%), and the Netherlands (1.1%).

The authors concluded educational programs such as Net Frog have a positive effect on learning. They believed the Internet is a powerful instructional tool which will profoundly change learning and instruction (Kinzie et al, 1996).

Research on Attributes of the Innovation and the Rate of Adoption

"The receivers' perceptions of the attributes of an innovation, not the attributes as classified by experts or change agents, affect its rate of adoption." (Rogers, 1995, p. 209). The perceptions of the attributes of an innovation are the most important predictors of the rate of adoption. Rogers (1995) has identified five perceived attributes of an innovation: the relative advantage, compatibility, complexity, trialability, and observability.

Honey and Henriquez (1993) pointed out that the teachers viewed the computer network as useful to their professional development and for classroom purposes. The study also indicated that teachers felt integrating computer networking enabled them to give more time individually to students rather than spend time lecturing.

In an analysis of studies dealing with computer networking, Fulcer and Schofield (1995) found that ease and user friendliness were contributing factors to Internet use. Reliability of hardware and software components also seemed to be important factors to ease of use. (Fulcer & Schofield, 1995).

Research Situation

The Iowa public school district in which the investigation took place established a local area networking in October, 1995. The local area networking was piloted in an elementary school that had the largest student and teacher population. This elementary school also had the physical space available to house the necessary servers. The other elementary schools, the middle school and finally the high school were connected by March, 1996. This included networking and communication within buildings and within the district. Access to the Internet was provided in the second week of May, 1996.

Data Collection

The K-12 Local Area Network and Wide Area Network Assessment Survey (NAS) was developed as the study's data collection instrument. The survey included questions related to a) current use and perceptions of the Internet;.b) innovativeness and other personality characteristics of educators; and c) learner preferences pertaining to type of implementation strategies for increasing knowledge and applications of the Internet.

Results

The K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) was distributed to 240 educators employed by the Iowa public school district adopting the Internet. 110 surveys were returned. Of the 110, 100 surveys were usable.

Results included information about educators' in relation to demographics, innovativeness, and self perceptions of technological inclinations. The average age of educators in this sample was 40. The majority of respondents were female (78 females and 22 males). Most educators had been employed by the district for over 10 years. There was approximately equal representation from all grade levels. Some individual buildings had more respondents than others. The majority of educators had a bachelor's degree; 34% had a master's degree or above.

This sample of educators was found to be very similar to the general population in their willingness to change. On items intended to measure an individual's willingness to change, results from the NAS indicated a mean of 102.8 with a standard deviation of 11.4. According to Hurt, et al. (1977), in a normal population, the statistical mean is 102.

The raw scores ranged from 60.2 to 125.5 points. When compared to Rogers (1995) adopter categories, it was found that 12% of the respondents were categorized as early adopters, 48% of the respondents wer in the early majority category, 34% fit into the late majority adopter category, 6% fit into the laggard adopter category. None of these respondents fit into the innovator category.

Most educators wanted to learn about the possibilities of using the Internet in their classroom. Educators felt that the Internet was important to their district and to their classroom. They agreed that the Internet could provide many future resources.

Educators perceived the district as an innovative district. They believed that the administration supported the use of the Internet. and that more staff development on use of LAN and WA would be provided..

In this sample, educators indicated that they learned best by hands-on practice. While the majority preferred exploration time with some assistance to learn about the LAN and WAN, some educators preferred structured online activities.

Correlations revealed relationships among many variables. Most of these correlations were somewhat expected. For example, a positive correlation was found between innovativeness and technological inclinations, computer use, Internet use, and perceptions of the Internet.

Females ($\underline{M} = 102.4$) were slightly more innovative than males ($\underline{M} = 101$). However, results were not statistically significant.

Responses to open-ended questions indicated a need for more training on the use of the Internet. 75% of the educators responding to the survey had 10 hours or less of training on the Internet. Most of the training that the educators attended was required by the district (78%).

Responses also identified concerns about the slowness of the downloading and the lack of proper equipment necessary for classroom use. Many respondents indicated they were frustrated with the crashing of their computers when using Netscape. Some ethical issues such as misuse and pornography concerned educators as well.

Conclusions

The purpose of this study was to find out if schools used state provided technology funds to connect to the Internet, would educators adopt the Internet.

The innovativeness scores of educators were very similar to Hurt's general population innovativeness scores. Educators surveyed tended to fit into adopter categories at the same percentage as the general population. Educators followed the normal adoption of the Internet.

Educators' perceptions of the Internet provided insight into the adoption rate. They perceived the Internet to be important to the Iowa public school district. Educators believed that the Internet would provide access to many resources in the classroom and that the Internet had many possibilities.

In summary, this study indicated that teachers from the school district examined were generally similar to the general population in their level of innovativeness, and in their characteristics related to adoption of innovations such as the Internet.

References

Foa, L., Schwab, R.L., & Johnson, M. (1996, May 1). Upgrading school technology: supporting the zealots and other pointers for entering a strange new land. Education Week.

Fulcer, R.E., & Schofield, J.W. (1995). Wide-Area Networking in K-12 education: Issues shaping implementation and use. Computers in Education, 24(3), 221-220.

Goldsmith, R.E. & Nuegent, N. (1984). Innovativeness and cognitive complexity: A second look. Psychological Reports, 55, 439-455.

Hill, J.A. & Misic, M. M. (1996). Why you should establish a connection to the Internet. Tech Trends, 41. 2, 10-16.

Honey, M. & Henriquez, A. (1993). Telecommunications and K-12 educators: Findings from a national survey. New York: Center for Technology in Education (ERIC Document Reproduction Service No. ED 359 923)

Hurt, H.T., Joseph, K. & Cook, C.D., (1977) Scales for the measurement of innovativeness, Human Communications Research, 4(1), 58-65.

Iowa Public Schools Technology Bill, Senate File 2063, Seventy-sixth General Assembly. (1996).

Jacoby, J. (1971, May). Personality and innovation proneness. Journal of Marketing Research, Vol. VIII. 244-247.

Kinzie, M.B., Larsen, V.A., Burch, J.B., & Baker, S.M. (1996). Frog dissection via the World Wide Web: implications for widespread delivery of instruction. Educational Technology Research and Development, 44(2), 59-69.

Kirton, M. (1976). Adaptors and innovators: a description and measure. Journal of Applied Psychology, 61(5), 622-629.

Newman, D. (1989). Formative experiments on technologies that change the organization of instruction. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

National Science Foundation, 1980. Second Annual Science and Technology Report. Washington, D.C.: Government Printing Agency.

Peters, O. (1988). Distance teaching and industrial production: A comparative interpretation in outline. In: D. Sewart, D. Keegan, & Holmerg (Eds.), Distance educataion: International perspectives, (95-113). New York: Routledge.

Riel, M.M., (1986). The educational potential of computer networking, (Report no. 16) Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Rogers, E.M. (1995). Diffusion of Innovations. New York: Free Press.

Rogers, E. M. & Kincaid, D.L. (1981). Communications Networks: Toward a New Paradigm for Research. New York: Free Press.

Simonson, M.R., & Schlosser, C. (1995). More than fiber: distance education in Iowa. Tech Trends (41) 5, 13-15.

Wangen, N. (1982). The relationship of receptivity to change to personal characteristics and organizational perceptions of teachers in small schools. Paper presented to the American Educational Research Association, New York City, N.Y.

Applied Vocal Music Instruction on the ICN

Donald Simonson
Iowa State University

On October 13, 14, and 15, 1993 members of the ISU Department of Music Instrumental Faculty conducted the first experiments in applied music instruction on Iowa's then new fiber-optic network known as the ICN (Iowa Communication Network). Applied Music Masterclasses were offered for Iowa high school students who were preparing to audition for the Iowa All-State Music Festival. To fully test the capabilities of the fiber-optic system it was decided that masterclasses should be offered on the Clarinet (high frequencies), Trombone (low frequencies), and Percussion (broad frequency range). All three Masterclasses proved extremely successful and on that basis it was felt that no further experiments were necessary to test the functional efficiency of the ICN as a vehicle for applied instrumental music instruction. The next step was to design a test to evaluate the ICN's efficacy for applied vocal instruction. Such an experiment was scheduled for May 21, 1996.

ISU Department of Music Voice Faculty members Donald Simonson and Janet Alcorn are frequent Masterclass presenters throughout the Midwest, working regularly with both high school and college aged students. While Simonson was experienced with music instruction at a distance, particularly employing the ICN, Alcorn had never been involved in any form of distance education. She was, however, quite excited about the prospect of teaching applied music over the ICN. The subjects for the Masterclass were drawn from Valley High School, West Des Moines, IA, and Maquoketa High School, Maquoketa, IA, two of Iowa's finest high school music programs.

Unlike the Instrumental Masterclasses which were designed to assist students in their preparation for the Iowa All-State Music Festival Auditions, the Vocal Masterclasses focused on the student's preparation for the annual Iowa High School Music Association Small Group and Solo Contest. At Contest, students are adjudicated and ranked on their performance of two solos or small group (duet, trio, quartet, etc.) selections. Scores range from Division I (superior) to Division IV (poor). Unlike the All-State Auditions, in which all individuals on a particular instrument were required to perform the same musical selections, each student performing at Contest is allowed to choose music which suits their unique skill level or musical aptitude. The contest repertoire is drawn from the body of musical literature often described as 'Classical' but more appropriately titled 'Serious' or 'Art' music, and includes Operatic, Oratorio (Sacred), and Art Song selections, accompanied by piano. The last requirement, that of piano accompaniment, was a potential problem. Each ICN site needed an on-site piano. Luckily, the wide availability of electronic/digital keyboards precluded the need and extra expense for piano movers and tuners at each site. Both Valley and Maquoketa had excellent digital keyboards available which were easily transported to their respective ICN classrooms for the scheduled Masterclass.

On Tuesday, May 21 at 3:00 PM the Applied Voice Masterclass originated from the ISU Lagomarcino ICN Classroom. By 3:05 PM both the Valley and Maquoketa ICN sites had logged-on. There were a few technical glitches which were easily resolved by Ray Pregitzer, the ISU ICN technical specialist. After a brief introduction and tutorial on the Masterclass format and the operations of the microphones (no special audio equipment was employed for the Masterclass, only the standard ICN microphones), we were ready to begin. The first performer, Scott, a sophomore from Maquoketa moved into position, introduced himself, his teacher, the title of his selection, and started his performance. When Scott finished singing, the first order of business was to conduct a quick poll of the Valley and ISU sites to evaluate transmission quality of the performance. The results were surprising in the least. Both the audio and video quality were unanimously praised for their quality and clarity. While high quality was expected for the video, it was a question as far as the audio signal was concerned. Given the speech-only design parameters for the ICN Classroom microphones and monitor speakers, their ability to capture, transmit, and reproduce such a high-fidelity audio signal was an unexpected bonus. With all the technical concerns resolved the real work of the Masterclass began. The first performer, Scott, again moved into position and listened attentively to the comments and criticisms, following which he attempted to refine and adapt his singing along the recommended lines. As the presenters continued working with Scott, it became increasingly evident that the technology was quickly becoming transparent to all the participants. The

BEST COPY AVAILABLE

level of subtlety at which the presenters and participants worked was no different from that found in the typical voice studio. The only missing element was physical proximity, and that was never an issue of concern. In short, the ICN dissolved into the background. The Masterclass continued with a performance by Coeli, a junior from Valley High School. As before, the performance and ensuing comments, etc., progressed as if all the participants were in the same room. The session continued in the same fashion for the each of the four remaining student performers. As each student finished their portion of the Masterclass the presenters questioned them as to the quality of their ICN experience. In each and every case, the response was — excellent. The technology clearly proved itself to be an effective means of applied voice instruction.

Having completed the Applied Voice Masterclasses, the process of evaluating the effectiveness of the ICN as a delivery system for teaching applied vocal music remained. The evaluation process consisted of a brief follow-up survey that was distributed to each of the presenters, participating singers, accompanists, vocal music directors. All thirteen participants responded and completed the survey. The responses (in parentheses and emboldened below) are noted below.

The survey responses, being overwhelmingly positive, affirm the effectiveness of the ICN as a delivery system for applied vocal music instruction. Those participating school music teachers are convinced that the ICN can positively affect and impact the performance of their vocal music students. The ISU faculty presenters are also convinced of the ICN's potential as an educational aid. These results compare favorably with those collected for an earlier series of Applied Instrumental Music Masterclasses delivered over the ICN. In short, a negative word has yet to be spoken about the ICN and its effectiveness for applied music instruction. From the musicians and music educators point of view, it is a technology to be embraced, explored and exploited to increase and broaden the impact and reach of our art.

Reference

Simonson, D. (1994). The Iowa Communications Network as a Vehicle for the Delivery of Applied Instrumental Music Instruction. Encyclopedia of Distance Education Research in Iowa, 185-191.

Simonson, D. (1995). Applied Music on the ICN. Proceeding -Bridging the Distance: AECT Summer Conference, 426-437.

TEA-IDEA ICN
MASTER CLASS SURVEY

1. Before your ICN Master class experience, had you thought that teaching applied music was a possible use for the ICN?

   yes **(2)** no **(11)**

2. If you answered 1. no, why?
   Wasn't aware of the technology.(1)
   Thought of the ICN as a visual medium not an aural medium.(2)
   Just didn't think of it.(9)
   No reason or response given.(1)

3. What did you believe would be the greatest shortcomings of applied instruction over the ICN?

a.	Sound Quality	**(10)**
b.	Video Quality	**(0)**
c.	Ease of use	**(0)**
d.	Classroom/student management	**(2)**
e.	Interactivity	**(1)**
f.	Other (specify)	**(1)(Expected system glitches and bugs common to new technology)**

4. What were the greatest shortcomings of applied instruction over the ICN?

a.	Sound Quality	**(0)**
b.	Video Quality	**(0)**
c.	Ease of use	**(0)**
d.	Classroom/student management	**(0)**
e.	Interactivity	**(1)**
f.	Other (specify)	**(12)(No shortcomings)**

5. What did you believe would be the greatest benefits of applied instruction over the ICN?

a.	Access to experts	**(9)**
b.	Interactivity	**(0)**
c.	Ease of use	**(1)**
d.	Low cost	**(0)**
e.	Potential for increased input	**(4)**
f.	Other	**(2)(Didn't know what to expect)**

6. What were the greatest benefits of applied instruction over the ICN?

a.	Access to experts	**(10)**
b.	Interactivity	**(2)**
c.	Ease of use	**(0)**
d.	Low cost	**(0)**
e.	Potential for increased input	**(4)**
f.	Other	**(2)(Ability to access other participating sites)**

7. Please rate the following on a scale of 1 to 5, with 1 the lowest and 5 the highest.

a. Speech sound quality **(Mean Score)**

1	2	3	4	5	**(4.4)**
low quality		average quality		high quality	

b. Music sound quality

1	2	3	4	5	**(4.2)**
low quality		average quality		high quality	

c. Overall sound quality

1	2	3	4	5	**(4.3)**
low quality		average quality		high quality	

d. Video quality of media and music

1	2	3	4	5	**(4.8)**
low quality		average quality		high quality	

e. Video quality of instructor/student performances

1	2	3	4	5	**(4.8)**
low quality		average quality		high quality	

f. Overall video quality

1	2	3	4	5	**(4.8)**
low quality		average quality		high quality	

g. Ease of use as a passive participant

1	2	3	4	5	**(5.0)**
difficult		average ease		very easy	

h. Ease of use as an active participant

1	2	3	4	5	**(4.9)**
difficult		average ease		very easy	

i. Overall ease of use

1	2	3	4	5	**(4.9)**
difficult		average ease		very easy	

8. Compared to other forms of Distance Education delivery, how would you rank the ICN (scale of 1 to 5, 1 lowest-5 highest).

1	2	3	4	5	**(5.0)**
not effective		average effectiveness		highly effective	

9. What was your expectation of the effectiveness of applied music instruction over the ICN?

1	2	3	4	5	**(3.7)**
not effective		somewhat effective		very effective	

10. Based on your experience with the All-State Masterclass Series, how effective is applied music instruction over the ICN?

1	2	3	4	5	**(5.0)**
not effective		somewhat effective		very effective	

11. How likely are you to participate in future ICN applied music masterclasses?

1	2	3	4	5	**(5.0)**
not likely		somewhat likely		very likely	

Utilizing Distance Education to Deliver Secondary School HIV/AIDS Education

Margaret Torrie
Cheryl O. Hausafus
Iowa State University

Introduction

Family and consumer sciences (FCS) teachers and health teachers have primary responsibility for delivering HIV/AIDS education in middle schools and high schools. However, with the fast-changing body of knowledge concerning HIV/AIDS prevention and transmission, it is often difficult for teachers to keep abreast of current developments in HIV epidemiology, risk behaviors of adolescents, and community efforts to establish unselfish interest in the welfare of others.

Distance education is a mode of delivery for educational programs which connects teachers and students who are in different locations. The transmission of video and audio signals occurs in real time so that interaction is facilitated among participants at various sites. Technologies used to make distance education interactive include computers, cameras, microphones and speakers, facsimile machines, visual projectors, interactive television, CD ROM, video tapes and laser disc players.

Because HIV/AIDS is both sensitive and evolving as a field of study, communicating new information about the topic through more immediate modes of transfer needs to be explored. Distance education seems to be a promising instructional method. Therefore, the purpose of this study was to describe attitudes of current FCS and health teachers related to HIV/AIDS instruction and their perceptions of interactive distance education as an instructional mode for this content.

Methodology

A quantitative approach was used to investigate how distance teaching technology can enhance the delivery of HIV/AIDS education to middle level and secondary schools. The primary content areas responsible for AIDS education are FCS and health. To this end, a random sample of FCS and health teachers in Iowa (n=265) were selected to determine knowledge, attitudes, perceptions and experiences related to AIDS education and distance learning via the ICN.

Lists of all current Iowa FCS (n=519) and health (n=450) teachers were obtained from the Iowa Department of Education. A stratified random sample was selected. Questionnaires were mailed to 125 FCS teachers and 140 health teachers in Spring, 1994. Financial and time limitations prevented any follow-up procedures to the one-time mailing. Eighty-five usable questionnaires were returned for a response rate of 32 percent.

The surveys developed for this study included five parts: Part I—knowledge related to teaching HIV/AIDS and knowledge related to teaching through distance education technology; Part II—attitudes toward teaching HIV/AIDS, attitudes toward teaching through distance education technology, and attitudes toward teaching AIDS education via a distance education approach; Part III—perceptions of effective teaching methods for HIV/AIDS education, perceptions of effective professional development opportunities, and past involvement in professional development opportunities related to distance education technology; Part IV—reported use of teaching methods for HIV/AIDS education; Part V—teachers' demographic characteristics.

Data Analysis

Demographic data received from the respondents indicated that the respondents were generally female (80%), 36-45 years of age (52%), had four to six years of college education (99%), had ten or more years of professional experience (72%), and were currently teaching at the senior high level (90%). The preponderance of senior high school teachers in the responding sample was interesting. Expecially at the high school level, a school nurse may be asked to provide health education to the students and thereby be identified as a health teacher, yet none of the respondents identified their primary current position as school nurse.

When asked to indicate the various multi-media resources available in their school, nearly all teachers had access to a television, VCR, and computer, but only one-fourth (25%) said that an interactive television classroom was available to them on their school campus (Table 1).

Table 1. *Percent of teachers who have access to multi-media resources on their school campuses*

Television	100.0
VCR	98.8
Computers	98.8
CD-ROM	85.2
Video disc	61.7
Interactive television	25.0
Hypermedia	23.5

Only five teachers (6%) indicated that they had personally developed interactive teleteaching materials for the classroom in the past. In fact, over two-thirds (70%) of the teachers had received no professional training in interactive television technology. Among teachers who had received some professional training, the most helpful source of training was school inservice (36%) or a university course (36%).

When asked to identify what they believed would be the most helpful source of future training in interactive television, teachers overwhelmingly predicted that school inservice (68%) would be the most helpful.

When presented with nine sources of information about interactive television and distance education technology, teachers indicated those sources which they either had used in the past, or intended to use in the future to learn more about distance education (Table 2). AEA materials were the most frequently indicated (44%).

Table 2. *Percent of teachers who use or intend to use various information sources related to distance education*

Area Education Agency curriculum/ media materials	43.9
Professional journals and educational magazines	25.6
Newspapers	24.4
School curriculum/media materials	23.2
Television and radio	20.7
Personal curriculum/media materials	16.0
Popular magazines	14.8
Telephone technical support	9.8
Public library	7.3

FCS and health teachers answered 23 true/false items about their knowledge of HIV/AIDS. Teachers' knowledge was quite high. Table 3 indicates the percent of teachers responding correctly to each of the 23 knowledge of HIV/AIDS items. Coefficient alpha reliability for this scale was 0.56.

Three items (numbers 1, 5, and 9) were answered correctly by all teachers. These items reflect basic concepts related to AIDS transmission and fatality. Two items (item numbers 21 and 23) were answered correctly by fewer than half the teachers. This finding is of concern because these are the teachers responsible for delivering accurate AIDS education to secondary level students. The nature of these items dealt with the youthful age of AIDS victims and the use of spermicide to kill HIV virus.

FCS and health teachers answered 20 true/false items about their knowledge of distance education technology. Teachers' knowledge was disappointing. Table 4 indicates the percent of teachers responding correctly to each of the 20 knowledge of distance education technology items. Coefficient alpha reliability for this scale was 0.78.

Three items (numbers 27, 28, and 30) were answered correctly by more than two-thirds of the teachers. These items refer to immediate information transfer and use of laser discs. Fewer than ten percent of the teachers were able to answer correctly three items (numbers 31, 39, and 40). These items refer to interactive television classroom equipment. That only one-fourth of the teachers had an interactive television classroom available on their school campus may explain in part the limited knowledge regarding distance education technology.

Table 5 illustrates teachers' attitudes toward various aspects of teaching HIV/AIDS education. Coefficient alpha reliability for this scale was 0.77. It is not surprising that a large majority of the teachers considered themselves to be informed about HIV infection and AIDS education issues, because the sample for the study was comprised of health teachers who are charged to include this information in their curriculum. Eighty percent or more of the teachers believed in the importance of explicit HIV/AIDS curriculum designed for the age-related concerns of the student, and they were at ease talking about high-risk sexual behaviors with students. More than 80% of the teachers did not believe that AIDS education encourages youth to become sexually active.

These findings are encouraging in light of earlier research with a similar sample of teachers which indicated lower confidence and competence levels in teaching sexuality education topics. Almost two-thirds of the teachers indicated an attitude similar to that expected by the researchers. Teachers indicated that they could teach AIDS education concepts to both genders without embarrassment. Of

BEST COPY AVAILABLE

Table 3. *Percent of teachers correctly answering HIV/AIDS knowledge items*

Percent	Item #	Description
100.0	1*	The HIV/AIDS virus is not spread through sexual intercourse.
100.0	5	There is presently no known cure for AIDS.
100.0	9	The HIV/AIDS virus is spread through sharing drug needles.
98.8	2	Latex condoms are an effective, but not foolproof way to prevent the spread of HIV/AIDS virus.
98.8	13*	When concerned about HIV/AIDS, the safest way to practice unprotected sex is to have anal intercourse.
95.3	8*	The HIV/AIDS virus is spread through insect bites.
95.3	16*	The first positive blood test means that a person has AIDS.
95.2	18*	An individual easily can determine that he/she has been exposed to the HIV virus by the symptoms exhibited.
92.9	11	Individuals can infect others with the AIDS virus without being ill themselves.
91.8	10*	The HIV/AIDS virus is found in high concentrations in the saliva and tears.
91.8	7	If you are not in a "high risk group," you still need to be concerned about HIV/AIDS.
90.6	6	Most carriers of the HIV/AIDS virus do not know they are carriers.
90.6	15	The actual number of HIV positive cases in the United States is higher than the official number of diagnosed AIDS cases.
87.1	3*	There is good evidence that AIDS cannot be transmitted to a fetus before birth.
82.4	14	The incubation period for the HIV infection and symptoms that lead to the AIDS disease is up to 15 years.
80.0	12*	If you think you've been exposed to the HIV virus, you will know for sure if you get an HIV antibody test.
79.5	19	Approximately one-half of the nation's public school teenagers are sexually active.
75.3	20*	Of the nation's young people who are sexually active, approximately one-half take precautions to avoid the HIV virus.
72.9	17*	Several cases of AIDS in the United States are known to have been transmitted from one child to another in school or daycare.
64.7	4	People who provide help for someone with HIV/AIDS are not personally at risk for getting the disease.
64.7	22	The female condom or pouch is a barrier method that can be used to protect against the HIV virus.
47.6	21	In the United States today, approximately one-fourth of persons diagnosed with AIDS are less than 30 years old.
47.6	23*	It is a misconception that the spermicide, nonoxynol-9, helps kill the HIV virus during intercourse.

* Item statements as written are untrue, and the correct response is FALSE

particular interest are results for Item 51 where two-thirds of the teachers agreed that they felt they could personally make a difference in helping their students discontinue high-risk behaviors. Yet, results of responses to Item 52 indicate that just over one-third of the teachers agreed that they would feel comfortable using a model to teach condom use and disposal. The researchers believe that these incongruent findings suggest a direction for HIV/AIDS teacher educators interested in providing learning activities that involve both concrete and abstract conceptual development.

Attitudes toward teleteaching are shown in Table 6. Coefficient alpha reliability for this scale was 0.69. Three-fifths of the teachers responding indicated confidence in their ability to use interactive television technology and also felt they would not be embarrassed if their students could operate media equipment more skillfully than they could.

Three items were included in the instrument to explore the application of teleteaching technology as a means of delivering and enhancing HIV/AIDS education (Table 7). Coefficient alpha reliability for this scale was 0.71. Nearly a third or more of the teachers agreed or strongly agreed that teleteaching technology is a promising mode for providing an enhanced HIV/AIDS program. These results provide an incentive to conduct further studies to examine the desirability of using a distance learning environment to enhance instruction in certain content areas. These content areas may include topics identified as sensitive by a local community or topics for which teachers have expressed a lower comfort level when teaching.

Table 4. *Percent of teachers correctly answering teleteaching knowledge items*

Percent	Item #	Description
75.0	30	A laser disc looks like a larger version of an audio compact disc.
70.2	27	Teleteaching transmissions permit users to present new information immediately.
69.0	28	For repeated use, a video disc is more durable than a videotape.
53.6	37*	Spontaneity in teaching is prohibited when using interactive teleteaching.
48.8	43*	It is necessary to use stage makeup, as in broadcast television work, when teaching on the fiber optic network.
45.2	29	Any location on one side of a laser disc can be accessed within 8 seconds.
40.5	42	The teleteaching classroom facilitator at the receive site is responsible for classroom management when agreed upon with the point of presence teacher.
36.5	24*	Interactive teleteaching is NOT an appropriate approach for elementary grades.
34.5	26	Most interactive distance education classroom sites are appropriately equipped regular classrooms.
32.1	32*	Video cassette recorders can be converted to play laser discs with a simple adapting cable.
32.1	36*	Thunderstorms and other atmospheric weather conditions will affect fiber optic transmissions.
31.0	33*	Videotaping an interactive distance education presentation for transmission at a later date is the same as viewing the original transmission.
23.8	35*	Fiber optic technology emits an electromagnetic field comparable to that of a microwave oven, preventing participation by individuals with a pacemaker.
20.5	41*	When information is transmitted over fiber optic cable exceeding the 100 mile rule, visual and auditory quality at the receive site is reduced.
15.7	25*	Compressed video transmissions are preferable to fiber optic transmissions.
15.5	34	Transparencies and other visual images used with interactive television should be planned as a rectangle, which is wider than it is tall.
12.0	38	When developing transparencies for use in an interactive teleteaching classroom, the aspect ratio should be wide (landscape) rather than tall (portrait).
8.4	39*	Standard equipment in an interactive teleteaching classroom includes a sound activated microphone for student use.
7.3	40*	Acoustic quality is greatly enhanced when the interactive teleteaching visual presenter is used.
2.4	31*	The average shelf life of a video disc is 30 years.

* Item statements as written are untrue, and the correct response is FALSE

Summary

It is critical for teacher educators to recognize FCS and health teachers' current knowledge, attitudes, perceptions and experiences regarding the use of the ICN to deliver education in a dynamic content area such as HIV/AIDS. This information will help teacher educators address the concerns of teachers at preservice and inservice levels. In addition, the necessary speed of information exchange related to HIV/AIDS education topics makes it a candidate for priority status when determining use of the ICN. HIV concerns in the workplace and the establishment of safe practices in vocational education laboratories where transmission may result from spillage of body fluids are sensitive topics that might also be presented over the ICN. Interactive distance education as a delivery mode needs to be considered in relation to the instructional content.

This study explored teachers' access, knowledge and attitudes toward using a new form of technology to enhance HIV/AIDS education. Teacher educators are challenged to facilitate the development and delivery of such programs.

Table 5. *HIV/AIDS education attitudes*

Percent[a]	Item #	Description
88.2	54	I consider myself informed about HIV infection and AIDS education issues.
84.5	45	HIV/AIDS education needs to be explicit in line with the age of the student.
82.4	49*	HIV/AIDS education in schools encourages youth to become sexually active.
81.2	46*	I feel uneasy talking about high risk sexual behaviors with students.
76.5	53*	HIV/AIDS prevention education is too sensitive to teach in my community.
74.7	44	Sexuality education should begin at the lowest grade possible, i.e., preschool or early elementary grades.
69.4	47*	I'm embarrassed listening to my students talk about intimate sexual behavior.
67.1	51	I feel I can personally make a difference in helping my students to discontinue high risk behaviors.
64.7	48*	I'm apprehensive about raising certain sexuality topics in the classroom.
64.7	50*	I prefer teaching about HIV/AIDS to students of my gender.
35.3	52	I am comfortable when using a model to demonstrate male and/or female condom use and disposal.

[a]Percent indicates percent of responses that were "agree" or "strongly agree" for positively oriented items, or percent of responses that were "disagree" or "strongly disagree" for negatively oriented items.

* indicates items that were judged to be negatively oriented.

Table 6. *Teleteaching attitudes*

Percent[a]	Item #*	Description
60.7	57*	Interactive teleteaching is too complicated for me to do.
60.7	63*	I am embarrassed when my students can operate media equipment more skillfully than I can.
44.0	64*	Using interactive teleteaching for instruction makes teaching and learning too mechanical.
29.8	60*	I feel uneasy talking about teaching through interactive distance education.
28.6	66*	Interactive teleteaching does not allow normal social interaction in a class.
28.6	58	Interactive teleteaching should be used in all subject areas.
17.8	65	I consider myself informed about the use of interactive teleteaching in the schools.
17.7	55*	I am uncertain about integrating interactive distance learning technology with my teaching methods.
15.5	62*	I prefer using interactive distance education with students who have previously experienced learning in this way.
14.3	59*	I am uncomfortable when I use interactive teleteaching equipment.
8.3	61*	By using interactive teleteaching in mycourses, I will be expected to help troubleshoot equipment problems for others.

[a]Percent indicates percent of responses that were "agree" or "strongly agree" for positively oriented items, or percent of responses that were "disagree" or "strongly disagree" for negatively oriented items.

* indicates items that were judged to be negatively oriented.

Table 7. *Attitudes toward teaching HIV/AIDS education via teleteaching technology*

Percent[a]	Item #	Description
46.5	56	Interactive teleteaching will enhance the teaching-learning process related to sexuality and AIDS education.
38.1	67	Interactive distance education is a valuable teaching resource for HIV/AIDS education programs.
32.1	68	Each school should have an interactive distance education classroom available for instruction of HIV/AIDS.

[a]Percent indicates percent of responses which were "agree" or "strongly agree".

An Assessment of Iowa Secondary Vocational Teachers' Attitudes Toward Using Interactive Distance Education Strategies to Support Competency-Based Curriculum Reform Efforts

Margaret Torrie
W. Wade Miller
Iowa State University

Introduction

The purpose of this study was to assess the attitudes of Iowa vocational teachers toward using interactive distance education strategies to support the competency-based curriculum reform efforts mandated by the U.S. and Iowa Departments of Education. Specific objectives of the study were to identify:

1. teacher attitudes regarding the use of distance education in local vocational programs,
2. perceived advantages and disadvantages in using distance education,
3. specific courses and enrichment experiences provided by distance education, and
4. the desirability of teaching specified competencies in the vocational education core curriculum (leadership, job-getting and job-keeping, and entrepreneurship) via distance education.

Results may be used by vocational educators to establish priorities related to distance education. Further research in this area will be influenced by teacher acceptance and use of the Iowa Communications Network (ICN).

Significance and Need for Study

Vocational education is strongly influenced by federal and state legislation mandating parameters and content. The mission of vocational education, as defined by the Carl D. Perkins Vocational and Applied Technology Act of 1990, is as follows: "Organized educational programs offering a sequence of courses which are directly related to the preparation of individuals in paid or unpaid employment in current or emerging occupations requiring other than a baccalaureate or advanced degree." Such programs include competency-based applied learning that contributes to an individual's academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, and occupation-specific skills necessary for economic independence as a productive and contributing member of society.

Iowa legislation (Senate File 449), effective July 1992, provides for equal access to a wide range of quality programs by specifying program characteristics, minimum requirements, and competencies, as well as evaluation, regional planning, composition, duties of regional and merged area boards, and five-year planning. Iowa requires vocational education programs for 7th and 8th grade students as well as programs designed for high school and adult learners. Although vocational education programs have included programming for handicapped/special needs students since the mid-70's, an intense effort is now underway to assess the inclusion of courses designed for handicapped students at community colleges and area vocational-technical schools.

Vocational education discipline titles vary from state to state. However, they are commonly referred to as (1) agricultural education, (2) business education, (3) home economics/family and consumer sciences (FCS), (4) distributive education, (5) technical education, and (6) trade and industrial education. Instructional approaches include supervised work-study/cooperative education, in-class/laboratory instruction, correspondence education, and competency-based performance testing. Instructional settings vary to include the comprehensive secondary school, alternative high schools, home study, and industrial or community/business work sites.

Vocational educators historically maintained differences from general educators because of the need to focus on vocational and avocational skill acquisition and manipulative skills that are immediately relevant to learners. That is, concrete supersedes abstract learning in most situations, and hands-on applied learning is the preferred model. Typically, vocational teachers not only undergo preservice academic experiences, but also have work experience to support the discipline. Teacher education programs in vocational education encourage this type of student experiential base.

Distance education methodology is relatively unknown as an approach to providing vocational courses. It is anticipated that successful delivery depends upon a number of factors, including the adaptability of the technology to the aforementioned teaching/learning styles and overcoming perceived philosophical and physical barriers on the part of vocational teachers. The challenge is to identify effective and successful strategies or "a synthesis of best practices." Once these strategies are clarified, appropriate vocational curriculum methodologies can be written. The basic question that needs to be answered is: Do teachers perceive that distance education technologies can be used as a practical means to support the implementation of the standards for vocational education in Iowa?

Methodology

This study was descriptive in nature and involved the use of a mailed questionnaire. The questionnaire was developed by the researchers after a review of the literature, reviewed by a panel of experts, and pilot-tested by university graduate students.

The population for the study consisted of all secondary vocational teachers in Iowa as defined by the Iowa Department of Education in March, 1994. There were 2,420 vocational teachers at the secondary level from which a stratified sample of 12.4 percent was drawn from each of the discipline areas (agriculture, business, home economics, industrial, and marketing). A total of 300 teachers was selected: 29 in agricultural education, 14 in marketing education, 64 in home economics education, 90 in industrial education, and 104 in business/office education.

The questionnaire contained three parts. Part I assessed the level of knowledge and ability to use information regarding distance education teaching technology and curriculum reform. Part II explored respondents' interest in teaching a core curriculum to a cross-discipline vocational class. Specifically the three core concepts investigated were leadership, job getting and keeping, and entrepreneurship skills. Teachers were also asked if such a curriculum could be taught via the ICN in an interactive distance learning classroom with one or two remote sites. Part III requested information about the respondents' professional development and current professional responsibilities and assignments including distance education pedagogy. A final query looked at preferences regarding the acquisition and improvement of teachers' skills in teleteaching.

Results

Profile of Respondents

A total of 67 usable responses were returned to the researchers, a response rate of 22 percent. The majority of respondents (87%) reported that they had taught eleven or more years. The remaining teachers (14%) had 10 or fewer years of teaching experience. Most respondents (79%) taught at the high school level, while 19 percent taught at the middle school, four percent post-secondary, and three percent elementary (some taught at multiple levels). Almost two-thirds of the respondents (61%) indicated their highest level of formal education as a Bachelor's degree and about one-third (36%) held a Master's degree. One participant had a Ph.D. and one held a technical degree. All 67 respondents were certified as vocational teachers, and 62 (93%), were teaching vocational education subject matter. Three reported that they were teaching subjects outside of vocational education: one in science, one in foreign language, and one in literacy. Of those who were teaching vocational education subjects, there were 8 (12%) in agricultural education, 7 (10%) in marketing education, 14 (21%) in business education, 18 (25%) in industrial education, and 22 (33%) in home economics education (some taught in more than one area).

Three teachers (4%) had attended either a Star Schools inservice workshop or the Vocational Curriculum Institute offered through Star Schools, and nine teachers (13%) had attended an inservice program on teleteaching at their local school. Some of these teachers had also attended a Star Schools activity. Approximately 87% of the respondents had not attended any formal presentation on teleteaching or distance education. Eleven teachers (16%) indicated they had acquired their level of knowledge from other teachers. When asked how they would prefer to learn about and improve their skills in the teleteaching classroom, the majority responded "through an inservice offering" and "from other teachers." About one-third indicated a preference for "technical assistance," followed by teacher education courses at the preservice and graduate levels (20% each). Teachers were not very interested in acquiring information and skills on their own from printed materials or video tape.

Curriculum Reform and Instructional Technology

Part I of the questionnaire explored teachers' knowledge of various curriculum reform issues and their ability and interest in making substantive curriculum changes. Three sections were designed. The first focused on curriculum reform issues that included distance education. The second section asked teachers to indicate their ability to perform their teaching role in an interactive distance education environment. The third section requested teachers' level of interest in using prepared teleteaching lesson plans that required the use of community resources beyond the local site.

As indicated in Table 1, respondents were asked to indicate their level of knowledge relative to interactive teleteaching technology, federally mandated curriculum reform in vocational education, integrating academics and technology into vocational education, interactive teleteaching equipment, applications of distance education teleteaching to vocational education, and the creation of teleteaching plans for distance education. The response scale for their level of knowledge ranged from no knowledge (1) to extensive knowledge (5). Item means ranged from 1.69 to 3.21 and the overall mean score for the section was 2.50. The item teachers felt they knew the least about was how to create a teleteaching plan for distance education (item mean 1.69). The item teachers believed they knew the most about was federally mandated curriculum reform in vocational education (item mean 3.21). The second item teachers felt they knew something about was techniques for integrating academics and technology into vocational education (item mean 3.16).

Table 1. *Knowledge of vocational education curriculum reform issues that include distance education*

Statement	Mean[a]
Creating teleteaching plans	1.69
Applications of teleteaching	2.01
Interactive teleteaching technology	2.43
Equipment used in interactive teleteaching	2.55
Integrating academics and technology	3.16
Federally mandated curriculum reform	3.21
Overall mean	2.50

[a] 1=none, 2=very little, 3=some, 4=quite a bit, 5=extensive

Table 2 summarizes teachers' self-rated ability to perform their teaching role in an interactive distance education environment. Six items were listed for teachers to consider, with a response pattern ranging from (1) very inadequate ability to perform to (5) very adequate ability to perform the skill. Teachers rated themselves weakest in their ability to operate the equipment in interactive teleteaching classrooms (item mean 2.37) and highest in their ability to speak clearly with adequate volume and tone appropriate for teleteaching (item mean 3.58). With the exception of speaking ability, all other items were rated inadequate to unknown. The overall mean for these items was 2.75.

Table 2. *Ability to perform teaching role in interactive distance education*

Statement	Mean[a]
Operate the equipment	2.37
Handle unexpected technical problems	2.42
Evaluate mini-lessons	2.55
Employ a variety of teaching strategies	2.75
Attend to classroom management at separate sites	2.82
Speak clearly with adequate volume and tone	3.58
Overall mean	2.75

[a] 1=very inadequate, 2=inadequate, 3=unknown, 4=adequate, 5=very adequate

Items in Table 3 assessed the teachers' interest in using prepared teleteaching plans which require the use of resource persons from various settings: specifically, team teachers outside their discipline, team teachers within their discipline, guest speakers from business or industry, job interviews of students by professionals, and panels of potential employers to address students' questions. The response scale ranged from (1) absolutely yes to (5) absolutely no. The item means ranged from 1.87 to 2.36 and the overall mean for the section was 2.04, indicating that there is a strong interest in using resource persons beyond the local setting as a part of interactive distance education teleteaching strategies.

Table 3. *Teachers' interests in using prepared teleteaching lesson plans requiring resource persons*

Statement	Mean[a]
Panel of employers	1.87
Job interviews of students by professionals	1.93
Guest speaker from business/industry	1.99
Team teacher within your discipline	2.01
Team teacher outside your discipline	2.36
Overall mean	2.04

[a] 1=absolutely yes, 2=probably yes, 3=not sure, 4=probably not, 5=absolutely not

Core Competencies in Traditional Classrooms

Core competencies found in the Iowa Department of Education vocational education program management guide were listed in Part II of the questionnaire. Teachers were asked to indicate their beliefs, from strongly believe (1) to strongly disbelieve (5), as to whether the core competencies could be taught across vocational disciplines as a core curriculum to a mixed vocational class equipped as a tradi-

BEST COPY AVAILABLE

tional classroom. A traditional classroom was defined as an environment without distance education technology. The core competencies were grouped into three major categories: leadership (13 items), job-getting and job-keeping (21 items), and entrepreneurship (5 items).

Item means are indicated for each competency in Tables 4, 5, and 6. The means ranged from 1.25 to 2.01 for all of the listed competencies. An overall mean score was computed for each of the three areas: leadership (1.67), job getting and keeping (1.67), and entrepreneurship (1.91). The item means and the overall mean scores show that teachers do believe that the core competencies can be taught across the vocational disciplines in a core curriculum to a mixed vocational class in a traditional classroom.

Table 4. *Belief that leadership competencies can be taught in a traditional classroom*

Statement	Mean[a]
Follow directions	1.25
Speak effectively	1.48
Work with others	1.58
Prioritize tasks	1.60
Utilize time	1.64
Define goals/strategies	1.66
Organize an event	1.67
Lead a discussion	1.69
Delegate duties	1.70
Listen effectively	1.76
Adapt to situation	1.78
Resolve conflict	1.90
Facilitate group interaction	1.96
Overall mean	1.67

[a] 1=strongly believe, 2=moderately believe, 3=neutral, 4=moderately disbelieve, 5=strongly disbelieve

Core Competencies in Interactive Distance Education Classrooms

Core competencies found in the Iowa Department of Education vocational education program management guide were repeated in Part II of the questionnaire. This time, teachers were asked to indicate their beliefs, from strongly believe (1) to strongly disbelieve (5), as to whether the core competencies could be taught across vocational disciplines as a core curriculum to a mixed vocational class via the ICN with one or two remote sites. Again, the core competencies were grouped into three major categories: leadership (13 items), job getting and keeping (21 items) and entrepreneurship (5 items). Item means are indicated for each competency in Tables 7,8, and 9. The means ranged from 1.70 to 2.45 for all of the listed competencies. An overall mean score was computed for each of the three areas: leadership (2.09), job getting and keeping (2.10), and entrepreneurship (1.82). The item means and the overall mean scores show that teachers believe that the core competencies can be taught across the vocational disciplines in a core curriculum to a mixed vocational class in a distance education setting with no more than two remote sites.

Table 5. *Belief that job getting and keeping competencies can be taught in a traditional classroom*

Statement	Mean[a]
Work within guidelines	1.52
Follow rules	1.54
Complete required forms	1.54
Practice punctuality	1.58
Take responsibility	1.58
Personal hygiene	1.60
Express thoughts	1.61
Exhibit dependability	1.63
Personal interaction	1.63
Ask for help	1.63
Produce quality work	1.64
Respect property	1.64
Identify requirements	1.64
Comply with rules	1.67
Evaluate job offer	1.73
Accept differences	1.79
Clean work area	1.79
Manage time	1.81
Accept supervision	1.81
Demonstrate flexibility	1.88
Utilize equipment	1.91
Overall mean	1.67

[a] 1=strongly believe, 2=moderately believe, 3=neutral, 4=moderately disbelieve, 5=strongly disbelieve

Table 6. *Belief that entrepreneurship competencies can be taught in a traditional classroom*

Statement	Mean[a]
Business ownership	1.75
Business plan	1.88
Identify finances	1.94
Technical assistance	1.99
Recognize issues	2.01
Overall mean	1.91

[a] 1=strongly believe, 2=moderately believe, 3=neutral, 4=moderately disbelieve, 5=strongly disbelieve

Table 7. *Belief that leadership competencies can be taught in an interactive distance classroom*

Statement	Mean[a]
Follow directions	1.79
Define goals/strategies	1.82
Prioritize tasks	1.90
Listen effectively	1.94
Speak effectively	2.03
Work effectively	2.09
Utilize time	2.12
Delegate duties	2.13
Facilitate interaction	2.13
Lead a discussion	2.21
Organize an event	2.22
Adapt to situation	2.24
Resolve conflict	2.54
Overall mean	2.09

[a] 1=strongly believe, 2=believe, 3=don't believe, 4=strongly disbelieve

Table 8. *Belief that job-getting and job-keeping competencies can be taught in an interactive distance classroom*

Statement	Mean[a]
Identify requirements	1.70
Complete required forms	1.88
Work within guidelines	1.93
Express thoughts	1.94
Evaluate job offer	1.94
Personal interaction	2.00
Follow rules	2.00
Practice punctuality	2.04
Manage time	2.06
Produce quality work	2.07
Exhibit dependability	2.09
Ask for help	2.12
Take responsibility	2.13
Respect property	2.22
Comply with rules	2.22
Accept differences	2.25
Demonstrate flexibility	2.27
Accept supervision	2.28
Clean work area	2.28
Personal hygiene	2.45
Overall mean	2.10

[a] 1=strongly believe, 2=believe, 3=don't believe, 4=strongly believe

Table 9. *Belief that entrepreneurship competencies can be taught in an interactive distance classroom*

Statement	Mean[a]
Business ownership	1.73
Identify finances	1.81
Business plan	1.82
Technical assistance	1.85
Recognize issues	1.91
Overall mean	1.82

[a] 1=strongly believe, 2=believe, 3=don't believe, 4=strongly disbelieve

Summary and Conclusions

The purpose of this study was to assess the attitudes of Iowa vocational teachers toward using interactive distance education to support the competency-based curriculum reform efforts mandated by the U.S. and Iowa Departments of Education. The study was descriptive in nature and involved the use of 300 mailed questionnaires. A total of 67 usable responses was returned. All were certified vocational teachers and every vocational discipline was represented.

From an analysis of the data, the following conclusions are offered for consideration in furthering vocational education curriculum reforms that include the use of the ICN:

- At the time of the study, very few respondents had received any training on using interactive teleteaching technology.
- The majority of the respondents preferred improving their knowledge and skills as a part of a formal program in a group setting as opposed to individual study.
- Respondents' knowledge of interactive teleteaching technology and reform in vocational education was severely limited.
- Respondents' ability to perform their teaching role in an interactive distance education environment was limited.
- Respondents showed a strong interest in using prepared teleteaching materials.
- Respondents strongly believed core competencies could be taught across disciplines in a traditional classroom.
- Respondents believed core competencies could be taught across an interactive distance education environment.

From the results of this study, it is apparent that vocational educators desperately need more information to further curriculum reform efforts related to an interactive distance education learning environment and are willing to use teleteaching technology. Cross-disciplinary efforts can be realized through the teaching of core competencies in a distance education environment.

Reference

Iowa Department of Education (September, 1989). Highlights of S.F. 449.

Cluster 3:

K-12 Distance Education Experience

Gender and Group Gender Composition as Factors in Interaction Patterns and Attitudes of Students Working Cooperatively with Interactive Multimedia

Jane Mason Adamson
Iowa State University

Introduction

Within the past decade, the development of interactive multimedia technology has generated new learning experiences for students. The opportunity to work with interactive technology encourages students to actively engage in educational activities (Lucas, 1992; Riel, 1989; Seal-Wanner, 1988). Interactive television (i-TV) is a relatively new platform for distance delivery of interactive multimedia classroom instruction.

The i-TV program *Loess Hills Interactive* was developed within the last year through a collaborative effort by three Iowa-based corporations - Iowa Public Television (IPTV), Interactive Resources (IR), and Wallace Technology Transfer Foundation. The program was designed to be a resource for middle school science curricula. IPTV plans to deliver the program over a state-wide fiber optic network, the Iowa Communications Network (ICN). The ICN links IPTV to targeted schools within all 99 counties of Iowa. The program is stored on a remote computer server capable of simultaneously handling a number of schools. Students interact with the program by means of a digital audio-visual interactive device (D. A. V. I. D) box which translates the signal between the server, students, and the television monitor in the classroom.

Loess Hills Interactive presents historical, geological, archaeological, and environmental information about the Loess Hills region along the western border of Iowa. Students may choose to view the information from a number of perspectives. Options include extensive video footage of geological formations, flora and fauna, archaeological artifacts, student projects and field trips, and the Loess Hills of China. Students can also access reference materials, including maps and a specialized dictionary.

As they interact with *Loess Hills*, students control decisions about the order in which to view the information as well as their pace through the material. Student participation in the learning process is also encouraged throughout the program by the placement of review questions in the main videos and a quiz section. The program was specifically designed for use by small cooperative groups of three or four students. The development of a group presentation is part of the learning task. Groups "earn" the capability to choose and save media segments of the program by answering the on-screen questions. Students then may use the saved media segments during their group presentation about some aspect of the Loess Hills.

Peer interaction among students is a key element of cooperative learning (Webb, 1985; McCombs, 1985). The effectiveness of the cooperative learning experience seems to be influenced by the quality of the peer interaction in the learning groups (Battistich, Solomon, and Delucchi, 1993). Battistich et al. (1993) concluded that high-quality interactions as defined by friendliness, concern, and helpfulness were associated with positive attitudes toward school, self, and achievement. Low-quality interactions were associated with negative student outcomes. What transpires among students as they work together may have an important impact on the learning process, affecting both affective and cognitive outcomes.

Peer interaction in cooperative groups has been investigated both in traditional and in technology-based environments by a number of researchers. One of the significant independent variables is gender, both the gender composition of the group and the gender of the individual student. Since the early 1980's Webb has conducted a number of studies on peer interaction during cooperative mathematical problem solving lessons. Webb (1984) investigated gender differences in peer interactions between junior high math students. She looked at three types of groups: majority females, majority males, and equal males and females. In groups with equal numbers of males and females, students showed equal achievement and similar interaction patterns. In groups with a majority of females, females directed most of their interactions to males and showed lower achievement than males. In groups with a majority of males, the males tended to ignore the females and showed somewhat higher achievement than females. The giving and receiving of explanations were positively related to achievement. The results indicated that males and females in groups of varying gender composition had different learning experiences.

BEST COPY AVAILABLE

Although the students in Webb's studies were not using technology, research on students using technology-based elarning have supported her results. Lee (1993) investigated peer interactions of groups of students varied by gender composition. She used the *Peer Interaction Coding System*, developed during a pilot study, to categorized student behavior. She was interested in identifying interactions which might be significantly different for males than for females depending on group membership. She examined five variations of gender composition: all males, all females, majority males, majority females, and equal males and females. Students were videotaped as they worked with the computer-based program *Carmen San Diego*. She found significant differences in interaction patterns between males and females, based on group membership. Females tended to interact more frequently overall than males in all the groups except equal-ratio groups. In same-gender and majority-female groups, the females offered more task-related help than males; the results were reversed in equal-ratio and majority-male groups.

The importance of certain types of interactions with relation to achievement have been investigated by several researchers. As a result of his research, Hooper (1992) concluded that generating and receiving help were significant predictors of achievement. A study by Simsek (1993) supported Hooper's conclusions. He videotaped pairs of students working on a computer-based science program. Students were grouped homogeneously and heterogeneously by ability and were assigned either a learner control or a program control condition. He found positive correlations between providing elaborations, seeking clarifications, and achievement scores.

Kinzie, Sullivan, Beyar, Berdel, and Haas (1987) looked at gender and attitude as part of their study with 98 eighth-grade students working individually with computer-assisted instruction. They found that males had a more positive attitude and higher posttest scores than females. Dalton (1990) looked at gender grouping and interaction as part of his study with 98 fifth- and sixth-grade science students. Students worked in pairs with an interactive videodisc lesson. Females tended to prefer program control whereas, males preferred learner control. The males students tended to interact more competitively than the females.

To summarize, gender and group gender composition may be factors affecting both the interaction patterns and the attitudes of students as they work cooperatively with technology.

Significance and Need for Study

As the development of interactive technology and supporting software creates new learning opportunities for students, educators must determine how to integrate these experiences into the curriculum and implement them in the classroom. Educators and developers of multimedia alike should know if there are significantly different interaction patterns and attitudes between males and females in groups of varying gender composition as they work with interactive technologies. Because i-TV is a comparatively new distance platform for bringing interactive educational activities into the classroom, it would seem advantageous to investigate the issue of gender in an i-TV learning environment.

Purpose and Objectives

The intent of this study was to investigate differences in interaction patterns and in attitudes between males and females as they worked in cooperative groups varying by gender composition with the i-TV program *Loess Hills Interactive*. Also, the researcher desired to determine any significant correlations between interaction and attitudes for males and females. It was the intention of the researcher to provide direction for educators and program designers in the implementation and development of similar programs.

The dependent variables were (1) specific interaction behaviors, as measured by proportion or rate of frequency by individual, and (2) attitude toward the cooperative learning experience, as measured by a self-reported score on a Likert scale. The independent variables included (1) gender of student, and (2) gender composition of the learning group.

Given that student gender and group gender composition have been related empirically to interaction patterns and attitudes in other learning contexts, the following questions were asked by the researcher:

1. Are the interaction behaviors of males and females in cooperative groups working with i-TV independent of their group gender composition?

2. Is there a significant difference between males and females in their attitudes toward cooperative learning groups working with i-TV when analyzed on the basis of group gender composition?

3. Are there any significant relationships between specific verbal interaction behaviors and attitude toward the cooperative learning experience for males or females working with i-TV when analyzed on the basis of group gender composition?

Pilot Studies

In anticipation of this research two pilot studies were conducted with the following objectives: (a) to test the research procedure, (b) to determine the kinds of interactions that took place between students while working with *Loess Hills Interactive*, in order to develop an interaction coding system, (c) to obtain feedback on a proposed attitudinal survey, and (d) to refine the research questions for the subsequent dissertation research.

The subjects in the first pilot study were 48 seventh-graders in a rural middle school; the second pilot study involved 20 seventh-graders also from a middle school in rural Iowa. Students in both studies were randomly assigned to groups of four with varying gender compositions: (a) all females, (b) all males, (c) majority females, (d) majority males, and (e) two males and two females. The students were given only one period in which to work with a compact disk-interactive (CD-i) version of the program. The attitude survey was administered after they had completed their session with *Loess Hills Interactive*. The results of both pilot studies provided guidelines for the design of the more extensive study which followed.

Procedure

The researcher determined that the use of a professional quality camera, placed next to the TV screen facing the students and fitted with an external conference-style microphone, was adequate for recording the interactions. Placement of students on adjacent sides of a table seemed to simultaneously facilitate student discussion, viewing of the TV screen, and adequate recording levels. The occurrence of indistinguishable comments, especially when two or more students were speaking at the same time or when there was noise interference, was not eliminated.

Noise interference was minimized by the use of sturdy chairs without rollers or springs and the use of a sound-proof room. The program audio level needed to be moderately set to allow student voices to be heard over the program.

Development of the Interaction Scale

The identification of the various types of interactions that occurred among students in their cooperative groups was for the purpose of developing an interaction scale to be used for the subsequent research. In order to develop the interaction scale, the researcher categorized the interactions from tapes of a number of groups and then developed general categories. Three main categories of interaction were identified: (a) answering of questions and discussion of subject matter or project, (b) determination of where to go in the program, and (c) socio-emotional comments or questions.

Attitudinal Survey

The seven constructs on the proposed attitudinal survey were tested for reliability using the data from collected surveys (n=34). Some of the data was lost due to researcher error. Table 1 shows the constructs, their reliability, and their reliability if it is increased by the deletion of one question.

The reliability coefficients ranged from .19, (6) attitude toward cooperative learning, to .89, (3) emotional reaction to group. If the identified statements were deleted for each construct, the range would change from .58, (2) perception of peer helpfulness, to .90, (5) sense of group participation. Additional qualitative information about how to improve the survey was obtained through feedback from educators and students.

Methodology

The pilot studies and research were conducted in collaboration with a formal evaluation of *Loess Hills Interactive* by the Research Institute for Studies in Education (RISE) at Iowa State University. The research was implemented at two middle schools in Iowa over a period of approximately four weeks. School A was located in a farming community in south-central Iowa; school B was located in a middle-class suburb of the state's largest city. Both schools had a predominantly white middle-class student population.

A total of 127 seventh- and eighth-grade students participated in the study. Of the 127 subjects, 67 were females. With the exception of 13 talented and gifted (TAG) students, subjects were from general science classes and represented high, average, and low ability levels.

Table 1. Construct Reliability

Construct	Reliability
1. Perception of one's own helpfulness	.61 (.63 if question 4 deleted)
2. Perception of peer helpfulness	.58
3. Emotional reaction to group	.89
4. Sense of group accomplishment	.78 (.83 if question16 deleted)
5. Sense of group participation	.81 (.90 if question 21 deleted)
6. Attitude toward cooperative learning .	.19 (.84 if question 25 deleted)
7. Attitude toward science	.56 (.59 if question 27 deleted)

Students were randomly assigned by their teachers to predominantly four-person groups of the following designated gender compositions: (a) all females; (b) all males; (c) majority females; (d) majority males; and (e) two males, two females. Some groups of three or five students also were included in the study, for a total of 34 groups between the two schools.

IPTV provided both schools with on-line access, over a high-density (T-1) phone line, to *Loess Hills Interactive* for approximately four weeks. For approximately the first three weeks groups worked to complete the worksheets and prepare their presentations. The fourth week was designated for giving student presentations. Each group had one period per week to work with the program.

Instruments

Observation coding scale

The purpose of the observation coding scale was to quantify broad categories of interactions that occurred among students as they worked cooperatively with *Loess Hills Interactive*. The pilot studies, which were completed previously to this research, contributed significantly to the development of the interaction scale. The researcher used notes taken during the observations and detailed analyses of several taped group interactions to identify what kinds of interactions took place as students worked with the program. The researcher designed the coding scale to be used by a rater as he or she watched the videotapes of the interactions.

Based on a review of other interaction scales and the research of Battistich et al.(1993), the researcher endeavored to identify those interactions among the students in the pilot study which contributed to high quality interactions or low quality interactions. High-quality interactions directly facilitated accomplishment of the tasks involved in *Loess Hills Interactive*. Those tasks included completing the worksheets, earning points by answering on-screen questions, and developing a presentation using media elements of the program. Other high-quality interactions included those related to determining where to go in the program and participation in group or interpersonal dynamics, such as helping with the remote control, giving positive comments to the group or an individual, and participating in positive corporate expression. Low-quality interactions were identified as those which distracted from group or individual accomplishment, such as refusing to operate the remote control, making negative comments about the program, or addressing negative comments to the group or an individual. Table 2 shows the interaction categories with subcategories.

Table 2. Interaction categories and subcategories used for coding interactions within cooperative learning groups.

Categories and subcategories
Determining pathway and/or pace through program
asking for information/help
giving information/suggestions/responses
Accomplishing the tasks
asking for information/help
giving information/suggestions/responses
Socio-emotional
encouraging group or individual
discouraging group or individual
responding to program/task, positively
responding to program/task, negatively
responding to program/task, general
joking/being silly, sarcastic
Technical
Off-task
Uncodable

In order to establish a high reliability between three raters, a training period was implemented by the researcher, using the videotapes from the pilot study. First, the researcher discussed the interaction scale with the raters. Next, the raters and researcher together viewed a tape and completed the interaction form. Finally, each rater completed forms separately, comparing their results and discussing any discrepancies. The tapes were randomly divided among the raters to review separately.

Attitudinal survey

The investigator was interested in the students' perceptions of their interactions and their attitude toward the cooperative learning experience. The attitudinal survey was developed as part of two pilot studies conducted previously to this research. The researcher developed six constructs to measure attitude and perception: (1) perception of one's own helpfulness, (2) perception of peer helpfulness, (3) emotional reaction to group, (4) sense of group accomplishment, (5) sense of group participation, and (6) attitude toward cooperative learning. Table 3 shows the constructs with the corresponding statements to which the students responded. Students were asked to respond to the statements by circling a number on a six-item Likert-type scale. The response choices included: (a) strongly disagree, (b) disagree, (c) moderately disagree, (d) moderately agree, (e) agree, and (f) strongly agree.

BEST COPY AVAILABLE

Table 3. Attitudinal survey constructs with corresponding statements

Constructs with corresponding statements

- Attitude toward cooperative learning:
  - Working in small groups makes learning fun.
  - I usually prefer to work by myself.
  - Working in small groups helps me learn better.
- Emotional reaction to group:
  - I liked working with my group.
  - I would have been more comfortable working alone.
  - I would choose to work in this group again.
- Sense of group accomplishment:
  - My group worked too slowly for me.
  - Group members helped each other complete the lesson.
  - My group learned a lot from the program.
  - I could have accomplished more working alone.
- Sense of group participation:
  - Everybody in my group got to participate.
  - The group listened to everyone's ideas.
  - Everyone in the group helped each other.
- Perception of one's own helpfulness:
  - My suggestions and explanations helped other group members with the lesson.
  - I helped group members when they had questions about the lesson.
  - I did not help answer questions in my group.
  - I helped my group make decisions during the lesson.
- Perception of peer helpfulness:
  - My group members were helpful to me.
  - When I asked a question, my group members did not help me.
  - Members of my group explained what I did not understand.

Procedure

Observations were made of each group in both schools for at least one period (about 45 minutes) sometime during the first three weeks of the study. The attitudinal survey was administered by the researcher and a colleague to the classes after teachers indicated all the groups had finished, within two weeks after the observations were completed. The survey constructs in Table 3 were included with other survey statements which were part of the more comprehensive evaluation completed by RISE for IPTV. The researcher randomly chose two 10 minute segments per group for the interaction data. Approximately equal numbers of groups were assigned to each rater for the coding of the interactions.

Data Analysis

Data analysis will include descriptive statistics for the interaction and attitudinal data for each male and female in each type of group gender composition. A Chi-square will be used on the interaction data to determine if gender is independent of group gender composition. A 2 X 4 ANOVA will be completed using the data from the attitudinal survey, using gender and group membership as the independent variables; the researcher will look for any significant differences between males and females in the different group compositions. Finally, the researcher will use correlational statistics to determine if there are any significant relationships between types of interactions and attitudes of males and females in their various groups.

Bibliography

Battistich, V., Solomon, D., & Delucchi, K. (1993). Interaction processes and student outcomes in cooperative learning groups. The Elementary School Journal, 94, 1, 19-32.

Dalton, D. (1986). the efficacy of computer-assisted video instruction on rule learning and attitudes. Journal of Computer-Based Instruction, 13, 122-125.

Hooper, S. (1992). Effects of peer interaction during computer-based mathematics instruction. Journal of Educational Research, 85, 180-189.

Kinzie, M., Sullivan, H., Beyard, K., Berdel, R., Haas, N. (1987). Learner versus program control in computer assisted instruction. Paper presented at the annual meeting of the American Education Research Association, Washington, D.C.

Lee, M. (1993). Gender, group composition, and peer interaction in computer-based cooperative learning. Journal of Educational Computing Research, 9, 549-577.

Lucas, L. (1992). Interactivity: What is it and how do you use it? Journal of Educational Multimedia and Hypermedia, 1, 7-10.

McCombs, B. (1985). Instructor and group process roles in computer-based training. Educational Communication and Technology, 33, 159-167.

Riel, M. (1989). The impact of computers in the classroom. Journal of Research on Computing in Education, 22, 180-190.

Seal-Wanner, C. (1988). Interactive video systems: their promise and educational potential. Teachers College Record, 89, 373-383.

Simsek, A. (1993). The impact of cooperative group composition on student performance and attitudes during interactive videodisc instruction. In: Proceedings of Selected Research an Development Presentations at the Convention of the Association for Educational Communications and Technology and Sponsored by the Research and Theory Division. (ERIC Document Reproduction Service No. ED 348 025)

Webb, N. M. (1984). Sex differences in interaction and achievement in cooperative small groups. Journal of Educational Psychology, 76, 33-44.

Webb, N. M. (1985). Verbal interaction and learning in peer-directed groups. Theory into Practice, 24, 1, 32-39.

Cedar Falls Harp Project: Music Instruction on the Fiber Optic Telecommunications Network

Dennis A. Downs
Cedar Falls Community Schools

Introduction

Cedar Falls Community Schools District is one of only a few in Iowa that offers harp in the string orchestra program. There are three harp students at Peet Junior High School and Malcolm Price Laboratory School has an eighth grade harpist. When harp instructor Mary Beckman of the University of Northern Iowa (UNI) retired last June, her position in the School of Music was eliminated, leaving the school district with no private instructor. Beckman recommended Kristin Maahs Fallon of Des Moines as her successor, though a hundred miles separated the towns.

On alternating weeks, when Fallon did not drive the distance, she conducted harp lessons with students on the Iowa Communications Network (ICN), the state's two-way full-motion interactive fiber optic network. She only needed to travel a few miles from her home to the ICN site at Iowa Public Television (IPTV) in Johnston. The four harp students were transported by their parents to the Schindler Education Center distance education classroom at UNI. Lesson times were prearranged with Fallon, the students, and regional network scheduling coordinators.

Standard Operating Procedure

A harp was transported to the UNI classroom on alternating Wednesdays for four twenty-minute lessons scheduled from 3:00-4:20 pm. Technicians monitored the connection between the sites. The connection is programmed and controlled by a computer at the main network hub near Johnston. If problems arose, there was a "hotline" phone which allowed technicians to quickly communicate. Both the origination and receiving sites had three or four cameras and monitors to allow both students and instructor to continually see one another.

I acted as facilitator behind the teaching station at the front of the UNI classroom, working the touch screen computer controls for focus, zoom, and camera selection, and pressing the microphone switch when the students played or spoke. The students also had a nearby switched microphone on which they could speak. A small monitor in the teaching station desktop showed what image was being sent to the other site, allowing me to choose and set controls as we proceeded. The origination site (IPTV) audio was set to continually send. The originating instructor's audio, though, was cut off whenever a receiving site (UNI) microphone switch was pressed down. Close attention was required for me to know just when to operate the switch.

Eventually, the technician was able to set up our sending sound so it would remain engaged. This relieved me of that duty, unless I needed to speak to the instructor on a switched microphone. In his terms, he "removed the by-pass (mute) on the Local Node Control (touch screen), turned down #4 mike on the mixer to '0,' attached a remote lavaliere microphone to the player's lapel, and carefully adjusted the volume level down to minimize feed-back." He admitted this was somewhat creative and expressed doubt that most sites could modify their setup like this because the controls are usually not as easily accessible. Nevertheless, it was a great improvement to our overall effectiveness, spontaneity, and interactivity.

The cost of the ICN connection was $5 per hour. Instructor fees and travel costs were covered by a combination of student payment and grant funding sources.

Teacher Attitudes and Strategies

The harp instructor, Kristin Maahs Fallon, responded to a list of questions by the author.

Question 1: What teaching strategies worked well on the new fiber optic telecommunication system?
Answer: The teacher can play a portion of the piece the student is studying to give examples of how to play, [offer] interpretive ideas, and ask the student which example is better than another.

Question 2: What strategies, approaches, and methods in your instruction needed to be altered or compromised? How did you accomplish this?
Answer: It was important that I indicated measure and line for students to work on, and that they understood where I meant. It took longer to indicate a place in the music than if the lesson was live with teacher and student in the same room.

Question 3: What teaching strategies were hampered?
Answer: Playing together, the student can hear the teacher, but the teacher cannot hear the student when playing or talking. Getting the camera [framed] on the harp and teacher.

Question 4: What significant problems were encountered? How did you manage them?
Answer: The scheduled time was a problem at first. Then we were able to get a guaranteed 3:00-4:20 time. We have had no problems since this was settled.

Question 5: How do you feel about using this method? Have some of your feelings changed since the beginning?
Answer: I feel this system of teaching is a good means to connect student and teacher, but I also believe that the best [situation] is when teacher and student are in the same location. Yes, my view is that it is a temporary situation in which the Waterloo/Cedar Falls area (UNI included) needs to have a harpist living in the area to resolve the situation.

Question 6: What suggestions would you have for improving the system's effectiveness?
Answer: A voice-activated microphone for the students at the UNI site. A technician to assist me at the Johnston site when I arrive.

Question 7: Do you think harp instructors with only a few students would want to use this approach to expand their studio?
Answer: Yes. However, I feel only about half of the lessons should be televised. The rest should be live for best results.

Other comments?
Answer: I believe the University of the Northern Iowa must continue a harp instructor position in order for the Waterloo/Cedar Falls Symphony and the public school [harp] programs to continue in the future. I am well rooted in Des Moines, but I am willing to help the situation in Cedar Falls for some time.

Student Attitudes

The students enjoyed doing something new, though at first they seemed more apprehensive about the new setting, which could be expected. They adapted well and soon acquired good television presence and comfort level. A contributing factor to the degree of ease the students felt was whether others were in the room. The smaller the "audience" that was present, the more at ease they became.

Also, some technical problems hampered early lessons, which was counterproductive to student and instructor motivation and confidence. Operations improved with time and practice. Generally, the students felt they would like to continue using this approach on alternating weeks. The junior high students, two beginners and two relatively advanced players, responded to the following questions:

Question 1: How do you feel about having harp lessons on television every other week?
Answer: I enjoy it (1)
It's all right (2)
I'm a bit uneasy about it (1)
I dislike it (0)

Question 2: Has it become a bit easier each time you do one?
Answer: yes (2)
a little (0)
not much (1)
no (1)

Question 3: Are you able to see and hear the instructor well?
Answer: yes (1)
usually (3)
not much (0)
no (0)

Question 4: Do other things distract you during the televised lesson?
Answer: no (1)
some (2)
quite a few (0)
yes, a lot (1)

Question 5: Is it fun?
Answer: yes (1)
mostly (1)
not much (0)
no (2)

Question 6: Do you feel you are improving in your playing with these TV lessons?
Answer: yes (0)
somewhat (4)
very little (0)
no (0)

Question 7: Would you like to continue using this method?
Answer: yes (2)
maybe (2)
probably not (0)
no (0)

Question 8: What do you think are the major problems involved with this system?
Answer: - None, except for being able to talk and listen at the same time.
- Not enough time.
- We aren't always coordinated.
- Bringing the harp every three weeks.
- I'm always last, so it seems like I don't get as much done as others.

Question 9: What do you think would make it better?
Answer: - Nothing.
- More time.
- No extra people.
- Not having extra people around.

Problems and Solutions

The type of problems that arose were usually relatively small and manageable.

Logistical

Arranging university parking passes for drivers, transporting the harp, setting the camera angles for the players, and experimenting with microphone placement are examples of logistical problems. The parents and I took turns transporting the harp.

Technical

Our technicians solved several operating problems, including reconnecting the link when it was lost, clearing up a discolored picture, and communicating with the sending site about any concerns, such as picture quality, sound levels, and initiating the connection from an adjoining room. Fallon, though, was sometimes without technical assistance at the IPTV site. The greatest hindrance was for me to operate the microphone switch with somewhat intuitive timing. When our technician creatively solved this inherent drawback, our efficiency level jumped.

Scheduling

Since the ICN was activated in late August, 1993, requests for user times have far exceeded the capacity to accommodate them. The regional directors met to hammer out solutions and prioritize the overwhelming number of requests. The schedule is unforgiving in terms of use. When the allotted time has expired, the television screens switch back to a test pattern and audio is cut off, bringing an abrupt halt to the period. Participants at both sites must watch the clock carefully and alert one another before the cutoff time to allow an appropriate closure to the lesson. Rotating the lesson times helped assure that the same student would not always be last.

Interruptions

In order for the lessons to proceed smoothly, interruptions and distractions needed to be minimized. I felt my role as facilitator was to say as little as possible to the students or instructor during the lesson, to operate the controls adeptly, and to do whatever I could to put the students more at ease. People not directly involved in the lessons seemed to be somewhat distracting and affected the students' focus.

Benefits Gained

For the harp instructor wishing to reach students over a distance, this is an effective method. One could assert that this approach cannot completely replace the personal spontaneity of a live music lesson. I would generally agree at this point. However, I noted that the students usually gave extra effort to focus on the televised instructor. Today's young people are more tuned in to electronic media like television, computers, and video games. Instructors can take advantage of this high-tech mindset. The school string program benefits from the continued studies of harp players, who provide a special musical color for the orchestra.

Also, because harp playing involves easily visible external motions and produces a tone which can easily be transmitted and discerned, this televised method seemed to work relatively well. Other stringed instruments can be televised as well. A cello student at Wartburg College in nearby Waverly took lessons on the network from a professor at Drake University in Des Moines with notable success. Other instruments requiring more internalized motions might not be as adaptable to television as the stringed instruments, but all instruments can be successfully applied to some degree.

Summary

Like a new car, getting comfortable with the fiber optic technology required a little time; learning to operate a few video and audio buttons, adjust camera angles, and position players and furniture. Practically anyone could do it. The technicians managed the primary equipment and monitored the connection. Because of the high-quality audio and video, the instructor and students soon felt at ease and carried on almost normally.

Our students and instructor served as musical pioneers on the ICN, and tolerated some observers and a few early glitches. School orchestra directors who want to enhance their string programs by adding harpists, or connecting other string players with private instructors located elsewhere should consider this fascinating, effective new tool when and where the network telecommunication links are available. Harp teachers who have the problem of reaching students across distances should seriously consider using this new technology to expand their music studio in today's Information Age.

Assessing the Roles of Participants in Multi-Site, Foreign Language Instruction: Interaction in a Technology-Mediated Environment

Michael Fast
University of Iowa

Introduction

Fiber-optic Networking in Education

Recently in the state of Iowa over 100 schools have been linked to universities, colleges, government agencies, the Internet, and global satellite down-linking facilities through a newly installed state-wide fiber-optic network. An understanding of the full potential of the network is, perhaps, still beyond the grasp of educators at present. What is emerging, however, as those of us involved in its inception begin to research its role, is a picture of possible long-term, dramatic change in some of the fundamental characteristics of education. Such a change was initiated some twenty years ago with the mass-marketing of low-cost, desk-top computers, and is being consolidated today through fiber-optic transmission technology.

Fiber-optic networking combines powerful audio, video, and digital technologies within a single communications system of rapid, high quality data transmission. It enables teachers, learners, and other participants in the educational process rapid access through world-wide communications facilities to varied resources such as electronic databases, and potential remote collaborators and experts. Such communications may be dynamic, live, and interactive, or consist of text and graphic materials. More significantly, the network purports to facilitate two-way, real-time, interactive instruction across geographically dispersed sites through audio, video, and digital channels of communication. With such facilities, a radically different interpretation of the time and space of the classroom emerges, suggesting the merger of mainstream education (traditionally composed of single-site, full-time learners) with distance education (traditionally catering to the needs of part-time, employed, adult learners), the merger of the educational world with the commercial world, and of home-based learning with classroom-based learning.

For foreign or second language (L2) pedagogy, the claim that fully interactive instruction is possible in a multi-site environment is a particularly crucial contention. Contemporary L2 instruction is intimately linked to the notion of interaction (see, for example, Omaggio, 1993, and her discussion of the L2 communicative curriculum): it is at once the goal, the medium, and the content of L2 acquisition. Allwright (1984), for example, maintains that the provision of interactive activity in the L2 classroom facilitates the transfer of skills to the real world, enhances the acquisition of communicative skills and of formal knowledge of the L2, involves learners in the learning process, and is particularly effective when conducted through peer group activities. Ellis (1980) further supports the need for an interactive or communicative L2 pedagogy through comparisons with child first language (L1) acquisition research which shows that communicative activity has a positive effect on at least the rate and possibly the route of L1 acquisition.

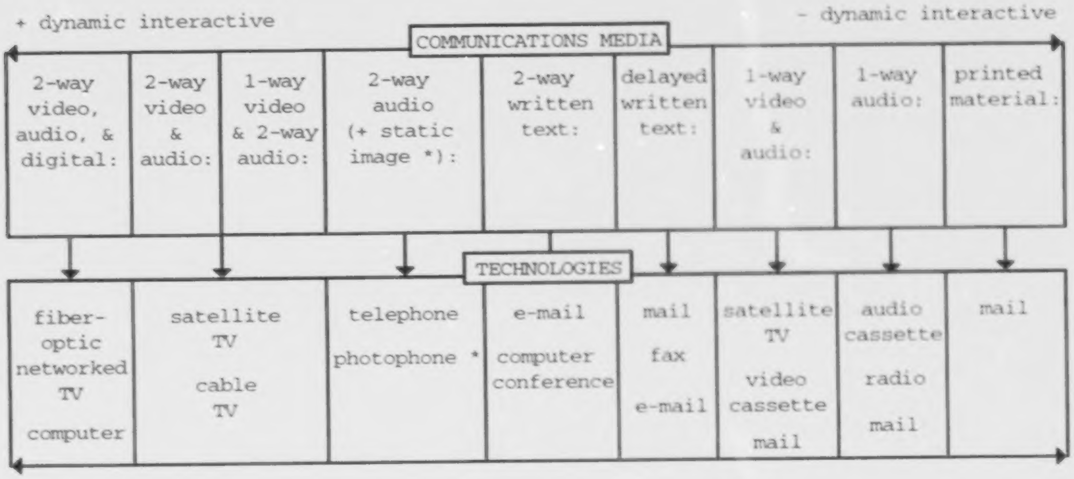
Since the demise of the behaviorist-inspired audio-visual and audio-lingual methodologies of the 1950s and '60s, an L2 curriculum based on the acquisition of performance skills in the L2 has been gradually defined and widely accepted in the profession (although perhaps not always as widely practiced). It is, then, of crucial importance that any multi-site, technology-mediated environment for L2 instruction be at least as effective at enhancing interaction as a single-site environment. Research needs to investigate and corroborate the claim that this is indeed possible.

Multi-site Technologies in L2 Instruction

Multi-site technologies in L2 instruction are not new. Figure 1 indicates the range of technologies (used either independently or linked with each other) and their interactive capabilities that are documented in the L2 literature (see, for example, Johnson & Iten, 1984; Kataoka, 1986; Eddy,

BEST COPY AVAILABLE

Figure 1. *Distance education technologies and corresponding communications media on a +/- interactive cline*



2-way video, audio, & digital:	2-way video & audio: 1-way video & 2-way audio:	2-way audio (+ static image *):	2-way written text:	delayed written text:	1-way video & audio:	1-way audio:	printed material:
fiber-optic networked TV computer	satellite TV cable TV	telephone photophone *	e-mail computer conference	mail fax e-mail	satellite TV video cassette mail	audio cassette radio mail	mail

1989; George, 1989; Wohlert, 1989; Gallego, 1992; Perrin, 1992; Yi & Majima, 1993). These technologies predominantly concern satellite and cable broadcast, which have helped to meet the educational needs of under-served populations, and to increase learners' dynamic exposure to native speakers of the L2 and their culture. They have, however, been characterized by a number of problems that have somewhat limited their pedagogical effectiveness and scope:

1. Many do not provide complete two-way audio and video interactive communication.
2. Remote-site learners are typically at a disadvantage compared to origination-site learners.
3. Some systems are open to public access.
4. Some systems require studio presentation of instruction.
5. Many are engineer, rather than teacher, controlled.
6. They involve narrow-band data transmission, limiting interactivity by kind, speed, and quality.

Fiber-optic networking, as Figure 1 suggests, provides a two-way interactive communications system which has greater speed and flexibility, higher quality, and a greater range of data transmission potential than earlier technologies. As such, many of the earlier problems now appear largely negligible:

1. Interaction is fully two-way audio, video, as well as digital.
2. Consequently, remote-site learners are in a more equitable situation vis à vis the origination-site learners than with earlier technological systems.
3. Fiber-optic networking is a closed access facility.
4. The system does not involve the teacher in a studio-prepared presentation of instruction.
5. The technology is completely teacher controlled.
6. Fiber-optics provides a broad-band network with multichannels of simultaneous video transmission, as well as audio and digital channels of communication.

Purpose of the Present Study

One of the most frequently voiced criticisms of technology-mediated, multi-site instruction concerns its ability to facilitate interaction across geographically dispersed sites. Warriner-Burke (1990) concludes that in distance learning: "Interaction between and among students is rendered extremely difficult" (p.130), while Arendt and Warriner-Burke (1990) are even less optimistic: "Interaction between teachers and students is in practice minimal or non-existent" (p.451). Davis (1988) maintains that:

> The problems most common to distance educators include encouraging student-teacher and student-student dialogue...(which is) exacerbated in many distance education programs because of the inflexibility of some prepackaged materials, the normal time-lapse between initiation and response and the

BEST COPY AVAILABLE

> frequent isolation of the student from the learning group (p. 548).

These personal observations clearly reflect a genuine concern that the technologies of multi-site instruction may not be adequate for the objectives of a communicative based L2 curriculum. However, given that fiber-optic networking provides a more powerful, more flexible, and more extensive means for interactivity in the multi-site environment, are the commonly voiced criticisms leveled at L2 distance education still valid? Can interaction of a quality and frequency typical of single-site L2 classrooms be generated and sustained on a fiber-optic network? In the almost total absence of evidence from research regarding the effects of multi-site technologies on L2 instruction, the claim that the widely accepted tenets of the L2 proficiency curriculum cannot be achieved in the multi-site environment remains an untested assumption.

Any research agenda which aims to assess the effectiveness of multi-site technologies for L2 instruction must address the issue of the role technology plays in supporting and sustaining interaction. This must be done in theoretically defined and measurable terms such that comparisons can be carried out with other multi-site L2 research projects or with non-distant programs. In light of this need, and with reference to L2 instruction via (1) a two-way audio/one-way video microwave system, and (2) the newly installed fiber-optic network in the state of Iowa, the present research study considers and applies a methodology for describing interaction in multi-site, technology-mediated environments. The methodology will facilitate an operational definition of "interaction" in terms of parameters and their subcategories, and the identification of strategic behavior on the part of the various participants in generating and sustaining interaction.

A Conceptual Definition of Interaction

Central to the present research study are the concepts of "interaction" and "communication" as used within the field of L2 pedagogy. Clear definitions of the two terms, either of a conceptual or an operational nature, typically do not appear in the pedagogical literature. Allwright (1984) argues that of the four justifications which he cites for the integration of communicative activities in the L2 classroom, only the last one uniquely involves live, person-to-person encounters, while the other three include interpretations of "communication" where non-interactive work may be taking place (with audio or written text stimuli, for example). Thus, "communication" suggests the expression of a message to a specific audience, which may be transmitted by oral or written modes and by live or recorded media, but does not entail exchange of reactions. It is the successful transmission of a message and is achieved, for example, when somebody reads and understands an advertisement posted on the side of a bus, listens to and decodes an item of news on the television or information transmitted by a teacher in the classroom. "Interaction," on the other hand, specifically concerns the dynamic and integrated, verbal or non-verbal actions and reactions of all participants in a communicative event, described by Malamah-Thomas (1987) as "a constant pattern of mutual influence and adjustment" (p.7), and by Allwright (1984) as "this joint management of learning" (p.156). It is this two-way, dynamic participation in communication, i.e., interaction, that forms the basis of an effective pedagogy for L2 instruction and is the object of analysis in the present research study.

Interaction is composed of various characteristics that may conceptually define the term. Three features were considered of particular interest for the present study. First, the coding and decoding of a message is facilitated by the existence of shared, extra-linguistic, contextual features in interaction. These contextual features may range from gestures and other non-verbal behaviors of any of the participants in interaction, to dynamic as well as stable situational characteristics. Such features help speakers and listeners in live, face-to-face interaction in the coding and decoding process. For L2 speakers and listeners involved in L2 interaction, contextual clues, whether of a gestural, facial, or broad situational type, are of crucial importance because they provide information which may not be understood at the linguistic and supra-linguistic levels. Altman (1989) describes the importance thus: "As any language learner knows, this added nonlinguistic channel is often paramount in the process of understanding. A difficult message can be made accessible with no more than a few hand signals that confirm or modify the contextualizing indicators provided by the text itself" (p.9). Of particular importance to the present study is the assessment of whether such contextual clues are available to all participants in a multi-site, technology-mediated environment for interaction.

A second crucial feature of interaction is what the literature describes as "negotiation of meaning" (for L1, see Brown & Yule, 1983; for L2, see Allwright, 1984; Ellis, 1984; Long, 1983). Typically classroom interaction is characterized by roles that involve the teacher in "directive" behavior and the learner in "compliant behavior" (Allwright, 1984), the former composed of questioning, informing, and directing strategies, the latter involving verbal responses, non-verbal reactions, acknowledgments, and frequently passive behavior. More typical of interaction in non-classroom environments is a mode of participation known as "negotiation of meaning," in which the verbal actions of one speaker evoke reactions in a second speaker, which then influences his/her subsequent action. In reference to L2 interaction, Ellis (1984) has described this as "vertical collaborative construction of meaning." Research in L2 acquisition indicates that negotiated meaning in the L2, especially through small-group or paired activities highlighting peer interaction, positively affects L2 acquisition (see Long, 1983; Pica & Doughty, 1985; Schinke-Llano &

Vicars, 1993). Interaction including the feature of negotiated meaning must also be facilitated in the multi-site, technology-mediated environment if it is to be considered effective for L2 instruction.

The third feature of interest to the present study which characterizes interaction is that of input. Input, although rarely given any operational definition in the literature, is understood as the complete linguistic signal within which a message may be embedded (see, for example, Ellis, 1985, p.298), and may be derived from any of the participants in interaction or from non-dynamic, technology-mediated sources. Much research has been conducted to assess the type of and extent to which L2 input may correlate positively with L2 acquisition. (See Chaudron, 1988, for a summary of this research.) Of particular relevance to the study at hand is the extent to which input is made available to all participants in interaction within an environment that is not uniquely face-to-face and is predominantly technology-mediated for all of its participants.

Research Questions

The conceptual framework underlying the present research thus highlights interaction for a communicative L2 curriculum as being composed of three crucial features: non-linguistic context, negotiated meaning, and availability of input. This study attempts to assess the extent to which these features are characteristic of interaction in multi-site, technology-mediated L2 instruction, specifically within a two-way audio/one-way video microwave system for the first phase of the study, and within the fiber-optic network of the state of Iowa for the second phase of the study. The research questions that guided this study are:

1. To what extent are the non-linguistic, contextual features of interaction made available to all participants in multi-site, technology-mediated, L2 instruction?
2. To what extent is interaction composed of negotiation of meaning?
3. To what extent is input made available to all participants?

Method

Given the mainly linguistic focus to the questions posed in this study, a discourse analytical framework, as opposed to an interaction analysis framework, was selected for the design of the instrument. Interaction analysis methodology can best be viewed as focusing on contextual issues to classroom behavior with the verbal content forming part of the context. Discourse analysis, on the other hand, considers the structure of the verbal content with para- and non-linguistic information playing a supporting role. In light of this distinction, Sinclair and Coulthard's (1975) framework for discourse analysis, which offers a complete, functional-structural descriptive tool in the character of Hallidayan grammar, forms the basis of the instrument designed for this study.

The Sinclair and Coulthard model revolves around a hierarchy of analytical levels moving from the act, at the lowest level, through moves, exchanges, and transactions. Each rank is composed of units of the lower level. Transactions may be considered as roughly analogous to distinct pedagogical stages within the lesson, while acts represent minimal units of functional significance. From a methodological point of view, Sinclair and Coulthard's analytical framework is somewhat complex to apply, but with thorough training of raters, the rewards obtained from its use well compensate for efforts expended in preparing suitable coders.

In addition to the levels of analysis determined by the Sinclair and Coulthard tool, the following parameters were included in the final instrument to capture other aspects of the technology-mediated, multi-site, instructional process: participant (teacher, student, remote-site facilitator), location of participant (origination-site, remote-site), technological medium (camera focus, supplementary audio, supplementary video), linguistic or paralinguistic medium (L1, L2, L1+L2, gesture), and length of time of transaction. All parameters of analysis were applied to linguistic and paralinguistic data obtained from video-tape observation of Russian classes taught during the spring semester of 1994.

Phase 1: Microwave Broadcast Russian

Phase one of the study was guided by two objectives: (1) to acquire preliminary evidence of reliability and validity in support of the use of the instrument; and (2) to respond to the research questions in respect to L2 instruction carried out on a different technological system to that of the second phase of the study. The first phase of the study was conducted deriving on-line, video-taped data from a Russian level 1 high school class of 40 minutes in length taught on a microwave system. The microwave system provided teacher operated, two-way audio and one-way video communication between origination and remote-sites; the students in the remote-site were thus able to receive a video signal from the site of origin of instruction, but the teacher did not receive a return video signal. The observed class originated from a large, urban high school and was made up of 14 students (11 males and 3 females; 9 freshmen, 2 sophomores, 2 juniors, and 1 senior; mean age = 15). It was linked to three small, rural high school remote sites with a total of six students present (2 male sophomores at 2 sites, and 4 8th grade females at the remaining site, with a mean age of 15). No moderators were present at the remote sites. The instructor was a female practicum teacher with self-reported advanced skills in spoken and written Russian. Her overseeing teacher was an experienced distance instructor of Russian.

Three raters were selected from the graduate population of the Department of Foreign Language Education at the university where the research was being conducted. They were chosen on the basis of the range of specializing languages they exhibited (Japanese, Russian, and Spanish), their L2 education experience, and their willingness to participate in the study. After approximately seven hours of training using the Sinclair and Coulthard framework for discourse analysis, the three raters were asked to code, independently, over a period of three weeks, and at the 'act' level of analysis, a linguistic and para-linguistic transcript of the phase 1 data. Raters were supplied a copy of the video-tape with the written transcript. Using a coded version prepared by the present researcher (whose professional background includes extensive applied linguistic training) as the standard measure, contingency tables were constructed to assess the degree of criterion-related agreement (Frick & Semmel, 1978) between the coders and the criterion measure. Raters were then asked to carry out two further tasks: (1) to provide a single, coded version of the transcript based on agreement between the three raters, and (2) an independent coding of a randomly selected portion of the discourse (representing 12.1% of the total transcript), which was used to assess the stability reliability of raters' coding after four months of practical exposure to the analytical tool. Levels of analysis of the raw discourse data above the level of 'act' were derived from the raters' joint rating of the transcript, as were the data for the remaining parameters (participant, location of participant, technological medium, linguistic or paralinguistic medium, and length of time of transaction).

Results of the assessment for evidence of reliability and validity are now presented, while results derived from phase one of the study regarding the research questions are left for comparison with phase two data in the results section of this paper. With respect to measures of reliability and validity of the Sinclair and Coulthard tool, criterion-related agreement figures obtained from the first independent coding task and based on a corpus of 851 acts were P = 0.55, 0.42, and 0.48 (where P = level of agreement) for each of the three raters A, B, and C. (See Light, 1971, for the analytical procedure.) Inter-rater agreement was calculated at P = 0.33. On the second task in which raters were asked to produce a coded version of the data which represented 100% inter-rater agreement, agreement with the same criterion measure was P = 0.83. The third task involved raters in an independent coding of a randomly selected section of the transcript. Criterion-related figures for this task were P = 0.69, 0.80, and 0.83, on a corpus of 103 acts, while inter-rater agreement was calculated at P = 0.70. When intra-rater agreement was calculated between individual scores on task 3 and scores on the same section of the transcript from task 2 used as criterion, agreement rates were P = 0.67, 0.80, and 0.86. Thus, figures indicate an expected low criterion-related agreement after the initial coding task. Inter-rater agreement at P = 0.33 was also predictably low, suggesting considerable random application of many of the 25 'act' categories of the instrument. After four months of training and coding, intra-rater measures achieved across task 2 and task 3 indicated stable use of the instrument, while criterion and inter-rater levels of agreement have each converged to a more reasonable, if slightly low, rate. (P = 0.85 and above being considered as an acceptable level of agreement, according to Light, 1971.) This convergence of ratings, obtained through training over time, suggests that the instrument can be used to adequately capture distinctions in the verbal and non-verbal behavior of participants in classroom-based interaction.

Phase 2: Fiber-optic Networked Russian

Phase two of the study was conducted using a level 3–4 Russian class taught on the fiber-optic network in the state of Iowa. On-line, video-tape data were derived from the origination-site, while at the remote-site, video-tape data were captured by live filming. The additional camera located in the remote site was assumed not to have had any contaminating effect on the data since students were accustomed to being filmed during their fiber-optic networked, Russian classes. The observed class, of 30 minutes in length, originated from a small, urban high school and contained nine students, linked to one rural, high school remote site with a total of seven students present. A female facilitator employed specifically for the task of facilitating distance instruction was present at the remote site. The teacher at the origination site was male, with nine years of experience as a Russian instructor, including one year in distance education. The observed class involved a specific focus on the linguistic needs of a sub-group of students (two at the origination site and two at the remote site). The remaining students participated in group work which was not monitored by the teacher during this class.

Results

General Characteristics of Interaction

Table 1 presents a synthesis of the data related to the general characteristics of interaction in a two-way audio, one-way video, microwave Russian class compared with a fully interactive, fiber-optic Russian class. Frequencies and percentage proportions are indicated in respect to the major categories of the Sinclair and Coulthard discourse analytical tool (acts, moves, exchanges, and transactions), together with the parameters of participant (T = teacher, S = student, F = facilitator), location of participant (remote site,

BEST COPY AVAILABLE

Table 1. *General characteristics of interaction*

	Frequencies		Percentage of Total	
	PHASE 1	PHASE 2	PHASE 1	PHASE 2
Length of class/minutes	40	30		
Acts	875	440		
Moves	569	289		
Exchanges	270	165		
Transactions	78			
Average acts/move	1.54	1.52		
Average moves/exchange	2.11	1.75		
Average acts/exchange	3.24	2.67		
T acts[a]	560	289	64.00	65.68
S acts[b]	315	133	36.00	30.23
F acts[c]		18		4.09
Remote S acts	48	55	15.24	41.35
Origination S acts	222	78	70.48	58.65
Class acts	28		8.89	
I-R-F exchanges[d]	85	23	31.48	13.94
I-R exchange[e]	66	33	24.44	20.00
I exchanges	31	32	11.48	19.39
(FR)(FO) exchanges[f]	56	42	20.74	25.45
T acts/Russian	312	151	55.71	52.25
T acts/English	224	118	40.00	40.83
S acts/Russian	120	20	38.10	15.04
S acts/English	122	61	38.73	45.86

[a] T = teacher

[b] S = student

[c] F = facilitator

[d] I-R-F = Initiation-Response-Feedback

[e] I-R = Initiation-Response

[f] (FR)(FO) = Optional Frame and Optional Focus moves

origination site, participants from both sites), and linguistic medium (Russian, English).

Question 1: Contextual Features of Interaction

Table 2 shows the frequencies and percentage proportions of data for research question 1: the extent to which contextual features of interaction are made available to all participants in multi-site, technology-mediated L2 instruction. Contextual features of interaction are measured by (1) acts supported by non-linguistic information that almost exclusively concern teacher behavior and mainly consist of gestures aimed at clarifying teacher use of the L2 (e.g., using fingers to denote the days of the week, pointing at watch when making a question related to time), and physical behavior that accompanies class management (e.g., pointing at sections of text, clapping in support of feedback, making camera changes); (2) acts which are conveyed exclusively through non-linguistic information (e.g., shaking and nodding head, nominating a student to reply by pointing); and (3) the technological media used to mediate interaction.

Question 2: Negotiation of Meaning

Results related to research question 2 — the extent to which negotiation of meaning characterizes interaction in multi-site, technology-mediated L2 instruction — are summarized in Table 3. It presents frequencies and percentage proportions of acts in terms of category of act. Sinclair and Coulthard's model for interaction analysis is composed of 22 functional acts which are related in various syntactic ways at the discourse level. At the heart of classroom-based discourse is a structure which Sinclair and Coulthard and other researchers have shown is predominant in teacher-learner interaction: Initiation-Response-Feedback (I-R-F). Various possibilities exist at the act level within this basic structure. The data presented in Table 3 attempt to show that for negotiation of meaning to characterize interaction students have to be involved in discourse which embraces other structures than that of Initiation-Response-Feedback. Comparative data are provided from two texts discussed in Sinclair and Coulthard (1975).

Table 2. *Context of interaction*

	Frequencies		Percentage of Total	
	PHASE 1	PHASE 2	PHASE 1	PHASE 2
Acts supported by visual information	217	106	24.80	24.09
T non-linguistic acts[a]	16	1	2.86	0.35
S non-linguistic acts[b]	10	15	3.17	11.28
T camera	386	173	68.93	59.86
S camera	18	96	5.71	72.18
Origination site S camera		51		65.38
Remote site S camera		45		81.82
OHP camera (texts)[c]	471	171	53.83	38.86

[a] T = teacher

[b] S = student

[c] OHP = Overhead projection

Question 3: Availability of Input

Table 4 presents a synthesis of the data relating to research question 3: the extent to which linguistic input is made available to all participants in multi-site, technology-mediated L2 instruction. The data are shown in terms of frequencies and percentage proportions of different acts that are not available to students at either origination or remote sites, and also in terms of the origin of the acts (teacher or facilitator). With respect to the fiber-optic class observed, data were obtained at both sites, and may be considered to be composed of interaction which is intentionally conducted between both sites, as well as of some interaction which was conducted to the exclusion of the other site. For the microwave class observed, data were collected only at the origination site and not at any of the three remote sites. Figures indicated in Table 4 for phase one of the study address unavailability of linguistic input only for the remote site, while for phase two of the study they address unavailability at both sites.

Discussion

General Characteristics of Interaction

Results indicate that teacher acts dominate student acts by a proportion of 64% to 36% and 66% to 30% in the observed microwave and fiber-optic classes, respectively. These results provide a superficial indication that interaction in the multi-site environment is comparable to that of the single-site environment. (See evidence for L1 instruction from Bellack et al, 1966, and Dunkin & Biddle, 1974, that teachers typically do about two-thirds of the talking.) It may be concluded from these results that a multi-site, technology-driven medium does not necessarily force teachers into a teacher-focused mode of instruction, as some critics of 'distance education' have assumed. With respect to student involvement in the remaining 30% of interaction, results indicate that remote-site students in the fiber-optic networked class are engaged in interaction to a greater extent than remote-site students in the microwave class. This may be accounted for in various ways and not necessarily as a product of a difference in media. First, the activity that predominated the fiber-optic class involved students in systematically responding to teacher questions. Interaction was thus shared through the structural efforts of the teacher. The activities established by the microwave class teacher more frequently involved unsystematically requested responses. The remote-site was only brought into the interaction when the teacher became aware that students there had not participated for some time. A second influence on these results may have been the fact that the fiber-optic teacher taught the class specifically to a subgroup at each of the two sites, each composed of two students; there was, thus, a more equitable distribution of participants for interaction. In the microwave class, participant distribution was significantly unequal, with 14 students located at the origination-site and six at the three remote-sites. Nevertheless, there clearly is a need to give careful consideration to activity design and management in order to engage remote-site students in an equitable manner.

Results regarding structural sequences of exchanges that characterized interaction in the observed multi-site environments do not provide any clear conclusions. The Initiation-Response-Feedback structure claimed as typical of classroom-based interaction does not appear to predominate in the two classes observed in this research study. The fiber-optic class consisted of a somewhat lengthy introduction composed of teacher informatives (a category of Initiation); this is reflected in the results which indicate a 20% use of Initiation moves without Response and feedback

Table 3. *Negotiation of meaning in interaction*

	Frequencies				Percentage of Total			
Student	PHASE 1	PHASE 2	S&C[a] 1	S&C 2	PHASE 1	PHASE 2	S&C 1	S&C 2
Elicits	39	26	0	4	12.38	19.55	0.00	2.50
Directives	2	5	0	0	0.63	3.76	0.00	0.00
Informatives	1	0	4	2	0.32	0.00	3.39	1.25
Metastatements	1	8	0	0	0.32	6.02	0.00	0.00
Checks	2	0	0	0	0.63	0.00	0.00	0.00
Loops	2	0	0	0	0.63	0.00	0.00	0.00
Head acts	47	39	4	6	14.92	29.32	3.39	3.75
Comments	9	4	0	0	2.86	3.01	0.00	0.00
Asides	13	4	0	0	4.13	3.01	0.00	0.00
Replies/Reacts/Lists								
Acknowledges	195	56	95	138	61.90	42.11	80.51	86.25
Starters	2	3	0	1	0.63	2.26	0.00	0.63
Markers	7	2	0	0	2.22	1.50	0.00	0.00

[a] S&C = Sinclair & Coulthard; figures in these columns were derived from the data for each of 2 studies presented in Sinclair & Coulthard (1975)

moves. Further examination of this aspect of the data is required to reveal a more detailed picture of the exchange structures found and the participants involved in them.

Teacher use of Russian compared to English reveals a comparable picture in both environments with frequency of use of the L2 exceeding that of the L1 by approximately 15%, proportionately 55% to 40%. Student use of L2 and L1 reveals greater disparity across the two media, with the fiber-optic class typified by 15% of total student acts in Russian and 46% in English. Student use of the L1 and L2 in the microwave class was approximately equal at 38% of all student acts. Remaining acts were either non-verbal or inaudible in nature. Little evidence exists in the research literature of comparative uses of L1 and L2 in classroom instruction by which the present figures may be judged. They may, however, be understood in light of the fact that Russian has a tendency to be taught within more conventional methodological approaches in which teacher-focused instruction in L1 predominates. This said, there are clear signs, indicated by a moderate T level of use of Russian, (M = 53.98% across the microwave and fiber–optic classes observed) that some of the conditions for L2 interaction are in place.

Question 1: Contextual Features of Interaction

Multi-site instruction is characterized by its use of audio and video technology to mediate verbal and non-verbal interaction. Even between origination-site students and the local teacher, interaction is technologically mediated in ways which it is not in the single-site environment. Students should always communicate through microphones, whether the message is directed essentially at the teacher, at the remote-site students, or at a local companion. In addition, much of the work carried out by the teacher with text and graphic materials is displayed on TV monitors for both origination and remote-site students to see. The camera is an important transmitter of non-verbal and other contextual information in the L2 multi-site environment.

In the case of the microwave class observed in this study, two cameras were used to provide visual context for interaction: a teacher focused camera providing the context of teacher behavior, which may also occasionally be focused on student group work at the origination site, and an overhead camera used to focus on teacher manipulated materials (7 non-illustrated written texts were used in this class). There was no return video signal from the three remote sites to the origination site. Fiber-optic networked instruction provides a richer and more varied video signal. In the class observed in this study, three cameras were located at the origination site, providing the visual context of teacher behavior, class behavior, and the use of teacher materials (6 non-illustrated texts were used in this class). The number of cameras found at remote sites may vary. At the remote site observed in the present study, three cameras provided return signals of class behavior, front of room behavior, and overhead focus on materials, although only the first of these cameras was actually used during this class.

Results indicate that approximately 25% of all acts in both the microwave (25%) and the fiber-optic class (24%) were accompanied by non-verbal behavior that was mediated by video technology. Much of this non-verbal behavior, unsurprisingly, was found in support of teacher participation in interaction. Such a relatively significant figure suggests that non-verbal information is an important ingredi-

Table 4. *Unavailability of input in interaction*

	Frequencies		Percentage of Total	
Act	PHASE 1	PHASE 2	PHASE 1	PHASE 2
Total acts unavailable		87		19.77
Acts unavailable to origination site		28		50.91
Acts unavailable to remote site	123	59	14.06	13.41
T acts unavailable to remote site[a]	9	17	1.61	5.88
F acts unavailable to origination site[b]		2		11.11
Elicits	11	12	7.33	16.67
Directives	0	6	0.00	37.50
Metastatements	0	4	0.00	11.11
Checks	3	0	16.60	70.00
Head acts	14	22	6.83	15.71
Comments	4	1	6.56	6.67
Asides	10	4	38.46	57.14
Replies/Reacts/Lists/ Acknowledges	64	19	28.32	20.21
Clues	1	0	11.11	0.00
Accepts	3	2	6.12	7.41
Prompts	1	0	5.56	0.00
Bid	1	0	50.00	0.00
Nominations	2	3	0.91	8.57
Inaudible acts	23	36	2.63	8.18

[a] T = teacher

[b] F = facilitator

ent in classroom-based interaction and should be exploited especially in L2 instruction. It remains a possibility that technology-enhanced, non-verbal contextualization of linguistic input in the L2 classroom may be an effective way of focusing on clues for the learner that are vital in the L2 coding and decoding process. Such clues may not be as readily available to students in single-site instruction where interaction is not mediated by technology.

Clearly the fiber-optic network with two-way video signals is a more complete and therefore more useful transmitter of non-verbal information than the one-way video microwave system. Acts that were transmitted exclusively as non-linguistic information were relatively infrequent in the data obtained in this research study. Results regarding camera use within the fiber-optic system suggest that the teacher was able to exploit the technology to mediate interaction whenever it was required. Seventy-two percent of all student acts in both sites were transmitted via the class-focused cameras, implying that complete video and audio signals were available for the same number of acts. Remote-site student acts were mediated 82% of the time while origination-site student acts were mediated 65% of the time. Sixty percent of all teacher acts were mediated in the same way. These figures provide a mean level of approximately 70% of fiber-optic-mediated acts where a participant in interaction was focused upon. By comparison the one-way video microwave system was unable to provide video contextualization of any remote-site participation in interaction, and provided only origination-site student participation when the teacher-camera was physically turned around to focus on student group work. Results also indicate a moderate level of use of overhead camera projected video of texts, occupying 54% of all microwave acts and 39% of all fiber-optic acts.

Question 2: Negotiation of Meaning

Evidence for student behavior beyond the predictable classroom role of responder to teacher Initiation moves was sought through an examination of student use of acts which are more typical of negotiated interaction. In terms of the Sinclair and Coulthard model of discourse analysis, negotiated interaction would involve participants in Initiation moves (informatives, elicitations, and directives), requests for repetition (loops), as well as some of the acts which indicate embellishment of a message (comments and starters), or boundaries between moves (markers). Both microwave and fiber-optic student behavior offer reasonably similar patterns of interaction. Predominant are the Response moves (replies, reactions, acknowledgments) of students in both environments (62% and 42% in the microwave and fiber-optic classes respectively). These figures, however, compare favorably with those provided by an analysis (carried out by the present researcher) of L1 classroom interaction in two single-site classes discussed by Sinclair and Coulthard (1975) in which student responses were estimated to be in excess of 80% as a percentage of total student acts.

The microwave and fiber-optic classes observed in this study also suggested that student Initiation moves, especially elicitation acts, were not uncommon, representing 29% of all student fiber-optic acts and 15% of all microwave student acts. These figures compare with 3% and 4% at each of the single-site classrooms discussed by Sinclair and Coulthard. The relatively high occurrence of student Initiation moves in the microwave class (as compared to the Sinclair and Coulthard single site data) were likely to have been a product of the fact that the teacher employed three unprepared, role-playing activities involving student-student negotiation of meaning. These role-playing activities were conducted exclusively in Russian, and led to short "de-briefing" sessions at the end of each in which the teacher provided feedback to the whole class. Evidence is provided here for the positive effect of adequate activity design and management on successful interaction. The even higher occurrence of student Initiation moves in the fiber–optic class appears to have been more a product of L1 use in social interaction peripheral to the content of the lesson.

Question 3: Availability of Input

Question 3 assesses the extent to which input — the complete linguistic signal — is made available to all participants in interaction. Of particular importance in this regard is the assumption that unavailable acts, typically for the remote-site students but also for the origination-site students, may seriously interfere with successful participation in interaction. For example, the unavailability of student replies as input renders subsequent feedback potentially useless, as may occur with any move or act within the discourse process. Given the somewhat passive social nature of the role of the student in traditional instruction, it is unlikely that the unavailability of acts, i.e., the breakdown of interaction, will provoke frequent requests for discourse repair. It is, therefore, incumbent upon the teacher to ensure that breakdowns in interaction do not occur, to predict conditions when it is likely to happen, and to employ adequate strategies to counteract the typically passive social nature of the role of the student. Results obtained in the present study indicate that for the fiber-optic class 20% of all acts were unavailable to students, either at the remote-site or the origination-site. This would appear to be a significant level of discourse deterioration, although further examination of the precise nature of the unavailable acts is required. For origination-site students, 51% of all remote-site acts were made unavailable, again a superficially high figure. This figure may be indicative of the fact that verbal interaction in the remote-site, typically consisting of comments on the ongoing instruction, is intentionally made for remote-site consumption only, even with the presence of a facilitator whose role may include control of non-instructionally related interaction.

Part of the ethos of student behavior in multi-site instruction appears to be that interaction should only be made available to the whole class when it has been provoked by the teacher. This is quite clearly a bi-product of a microphone-mediated instructional environment, one which needs careful evaluation for L2 instruction and the successful achievement of interaction. By comparison, 13% of all acts were made unavailable to remote-site students. Teacher acts which were unavailable to remote-site students reached a level of 6 percent of all teacher acts. Comparative results for the microwave class are somewhat narrower in scope since data were not obtained on interaction at the remote-sites. Levels of unavailability of acts to remote-site students from the origination-site were comparable to those in the fiber-optic environment, 14% of all acts, and 2% of all teacher acts.

With respect to the availability of specific types of acts, the following may be highlighted: 16% of all fiber-optic Initiation acts (informatives, elicits, and directives) were unavailable to students in either remote or origination sites; and the unavailability of 20% of fiber-optic and 28% of microwave Response acts (replies, reactions, and acknowledgments), were probably caused by students not depressing microphone buttons when responding.

Conclusion

This research study has essentially proposed a format for the analysis and description of interaction in multi-site, technology-mediated L2 instruction in the light of recent developments made in the scope of distance education technology provided through fiber-optic networking. As a basis for such analysis and description, it has used the discourse analytical model of Sinclair and Coulthard, together with additional parameters intended to capture technology and situation-related aspects of the instructional environments under observation. Given the lack of research tradition in the field of multi-site, L2 instruction, the present study provides some initial base–line data comparing two distinct technological environments for L2 instruction. Results obtained should be understood purely as a reflection of the specific environments from which they were derived, and as indications of trends and patterns of behavior that may be worthwhile pursuing. Use of the Sinclair and Coulthard instrument in the present study suggests that it may be an adequate tool for capturing the nature of technology-mediated classroom instruction and that its underlying systematic grammar provides an opportunity for the operational definition of interaction in terms of transactions, exchanges, moves, and acts. It should be stressed that ample investment in training suitably qualified raters must be made.

Warriner-Burke (1990), Arendt and Warriner-Burke (1990), and Davis (1988) have suggested that distance education environments impose limitations on the nature of interaction that may be generated across sites. Such limitations may imply a sacrifice in L2 proficiency standards which have been established with considerable effort over the last twenty-five years. However, criticisms of distance education which reduce media on the one hand and interaction on the other to single variables in a cause-effect relationship at best are based on untested assumptions in need of research, and at worst are gross simplifications of what essentially must be considered as highly complex multivariable behaviors. With respect to results obtained in the present research study, several avenues for further investigation come to light, including the effects of two-way video-enhanced, non-linguistic contextualization of linguistic input for all students, as well as qualitative work which may help to provide a more complete picture of the nature of interaction in multi-site, technology-mediated L2 instruction. Overall, the picture obtained from the present study suggests that successful interaction is more a product of the skill, patience, experience, confidence, and imagination of the teacher than it is of technology-imposed conditions.

References

Allwright, R.L. (1984). The importance of interaction in classroom language learning. Applied Linguistics, 5(2), 156-171.

Altman, R. (1989). The video connection: Integrating video into language teaching. Boston: Hougton Mifflin.

Arendt, J. D. & Warriner-Burke, H. P. (1990). Teaching all students: Reaching and teaching students of varying abilities. Foreign Language Annals, 23(5), 445-452.

Bellack, A. A., Kliebard, H. M., Hyman, R. T., & Smith, F. L. (1966). The language of the classroom. New York: Teachers College Press.

Brown, G. & Yule, G. (1983). Discourse analysis. Cambridge: Cambridge University Press.

Chaudron, C. (1988). Second language classrooms: Research on teaching and learning. Cambridge: Cambridge University Press.

Davis, J. N. (1988). Distance education and foreign language education: Towards a coherent approach. Foreign Language Annals, 21(6), 547-550.

Dunkin, M. J. & Biddle, B. J. (1974). The study of teaching. New York: Holt, Rinehart and Winston.

Eddy, B. D. (1989). Interactive tele-classes from Germany. In Flint Smith, W. (Ed.), Modern technology in foreign language education: Applications and projects (pp. 211-217).

Ellis, R. (1980). Classroom interaction and its relation to second language learning. RELC Journal, 11, 29-48.

Ellis, R. (1984). Classroom second language development. Oxford: Pergamon Press.

Ellis, R. (1985). Understanding second language acquisition. Oxford: Oxford University Press.

Frick, T. & Semmel, M. I. (1978). Observer agreement and reliabilities of classroom observational measures. Review of Educational Research, 48(1), 157-184.

Gallego, J. C. (1992). Tele-classes: The way of the future: A report on a language exchange via satellite. Foreign Language Annals, 25(1), 51-58.

George, P. (1989). Interactive television: A new technology for teaching and learning. CALICO Journal, 6(3), 43-46.

Johnson, M. S. & Iten, H. B. (1984). An attempt at televised foreign language instruction. ADFL Bulletin, 16(1), 35-38.

Kataoka, H. C. (1986). Televised Japanese language program: The first year. Foreign Language Annals, 19(6), 491-498.

Light, R. J. (1971). Measures of response agreement for qualitative data: Some generalizations and alternatives. Psychological Bulletin, 76(5), 365-377.

Long, M. H. (1983). Native speaker/non-native speaker conversation and the negotiation of comprehensible input. Applied Linguistics, (4), 126-141.

Malamah-Thomas, A. (1987). Classroom interaction. Oxford: Oxford University Press.

Omaggio, A. (1993). Teaching language in context. Boston: Heinle and Heinle Publishers.

Perrin, M. (1992). VIFAX: Learning a foreign language at a distance. Open Learning, February, 48-49.

BEST COPY AVAILABLE

Pica, T. & Doughty, C. (1985). Input and interaction in the communicative language classroom: A comparison of teacher-fronted and group activities. In S.M Gass and C.G Madden (Eds.), Input and second language acquisition. (pp.115-132). Rowley, MA: Newbury House.

Schinke-Llano, L. & Vicars, R. (1993). The affective filter and negotiated interaction: Do our language activities provide for both? The Modern Language Journal, 77(3), 325-329.

Sinclair, J. McH. & Coulthard, M. (1975). Towards an analysis of discourse. Oxford: Oxford University Press.

Warriner-Burke, H. P. (1990). Distance learning: What we don't know can hurt us. Foreign Language Annals, 23,(2), 129-133.

Wohlert, H. S. (1989). German by satellite: Technology-enhanced distance learning. In Flint Smith, W. (Ed.), Modern technology in foreign language education: Applications and pojects (pp. 201-210).

Yi, H. & Majima, J. (1993). The teacher-learner relationship and classroom interaction in distance learning: A case study of the Japanese language classes at an American high school. Foreign Language Annals, 26(1), 21-30.

Student Involvement in the Distance Education Classroom: Teacher and Student Perceptions of Effective Instructional Methods

Krista R. Schoenfelder
University of Northern Iowa

Introduction

Distance education has become a phrase describing any system using one or more technologies to link teachers and learners from one location to another (Education Satellite Network, 1994). It was originally defined as education in which the teacher and student were separated in time and/or space (Hardman, 1993; Stahmer, 1990). An additional characteristic was added to complete the definition—two-way communication between the teacher and student (Garrison, 1989; Stahmer, 1990).

Distance education has existed in one form or another since the early 1800s. In the past, distance education was associated with independent study. Initially, the learning process in distance education consisted mainly of students working with print materials (Garrison, 1989). As communications technology improved, distance education also changed. Bates, as cited in Garrison (1989), stated that new technologies accessible to educators allow for more variety in teaching activities as well as a higher quality of learning and more interaction and feedback for students. Some of the techniques used for distance education have included correspondence study, audio cassettes, and broadcast television (Feasley, 1983; Garrison, 1989; Hardman, 1993; Schlosser & Anderson, 1993). Each technique has its advantages and disadvantages.

Correspondence study originally referred to written instruction through the postal service (Verduin & Clark, 1991). Students participating in correspondence courses mailed assignments to their instructors, who then added written comments and sent these back to the students. There was very little, if any, direct communication between teachers and students (Giltrow, 1989). There are many advantages to correspondence study, including: (a) access to the course is available to all interested students, (b) the course can be completed when and where it's convenient for the student, and (c) material can be easily distributed to the students (Feasley, 1983; Garrison, 1989). There are also disadvantages to correspondence study (Garrison, 1989). The most important disadvantage is that communication between teacher and student is much slower than in the traditional classroom. Another disadvantage is that students do not have the opportunity to offer their suggestions as to what could be studied or how they learn best.

Using audio cassettes is another technique for delivering education at a distance. Students are provided with audio cassettes containing recorded material. Assignments are completed along with the audio cassettes and then sent to instructors for comments (Feasley, 1983). There are many advantages to using audio cassettes for distance education. Audio cassettes: (a) are easily available to all students, (b) can be completed when and where it's convenient for the student, (c) can be stopped and reviewed as needed, and (d) provide a more humanizing teacher-student relationship (Feasley, 1983). The main disadvantage, similar to correspondence study, is that communication between teacher and student is not immediate. Another disadvantage is that a high percentage of recorded audio material is too slow in delivery and often not phrased appropriately for efficient listening. It is also difficult for the students to locate specific points in the lesson on the tape or to split monologues into important points (Feasley, 1983; Lappia & Kirkland, 1989; Verduin & Clark, 1991).

Broadcast television is another method that has evolved to deliver distance education. In broadcast television, the signal is beamed to TV receivers without using wires or cables (Verduin & Clark, 1991). The main advantage of broadcast instructional television is that it combines both visual and audio communication (Garrison, 1989), allowing students to both see and hear the instructor. However, this communication is often only one-way. Students cannot communicate directly with the instructor. Other disadvantages to

BEST COPY AVAILABLE

using broadcast instructional television include: (a) more planning time is required, (b) more money is required to produce courses, and (c) individual differences among students are often not recognized.

Since the 1950s, many people around the world have participated in some form of distance education as an alternative to traditional classroom-based education (Giltrow, 1989). Distance education efforts were initially directed toward adults with work, social, and family commitments. These adults were unable to attend classes on a college campus because of these commitments. These learners have, in the past, been described as students who are endowed with strong study skills, high motivation, and discipline (Hardman, 1993).

A strength of distance education has been that it could be utilized in a variety of ways to assist in meeting the specific needs of school districts. By expanding the resources available to all learners, it has the potential to improve the performance of students and teachers (Education Satellite Network, 1994). Courses provided via distance education can also transport people and experiences to classrooms to broaden traditional instructional practices or provide entirely new alternatives. Distance education can link classrooms to homes, businesses, and other community locations and provide opportunities to reach parents, offer assistance with homework after the school day is over, or even create new groups of learners (Office of Technology Assessment, 1989).

In 1988, Congress initiated legislation to develop telecommunication activities to improve education for all students, especially those in small and/or rural schools (Education Satellite Network, 1994). The U.S. Department of Education introduced a program that focused attention on distance education in schools throughout the nation. The Star Schools Program, started in the late 1980s, sought to enhance instruction in mathematics, science, foreign languages, literacy skills, and vocational education for educationally disadvantaged students through the use of telecommunications networks (Education Satellite Network, 1994; Office of Technology Assessment, 1989; Simonson, Sweeney, & Kemis, 1993). Many school districts across the nation, including some in Iowa, received funding to aid in the development of distance education programs. Because of the Star Schools Program, an alliance, made up of educational personnel in Iowa, was created. Goals of the Iowa Distance Education Alliance (IDEA) included preparing, supporting, and improving distance educator instruction in Iowa so students could receive effective instruction at a distance (Herring, Smaldino, Thompson, & Schoenfelder, 1993).

One of the newer modes of distance education, interactive instructional television, is currently receiving a great deal of interest, especially in Iowa. Interactive instructional television links teachers and students at multiple sites. It combines characteristics of live, interactive, visual, and audio communication (Hardman, 1993). Systems of interactive instructional television include microwave, instructional television fixed service (ITFS), and fiber optics.

Problem

Schools have used distance education for numerous reasons, including: (a) lack of teachers in specific subject areas, (b) decreasing enrollments, (c) geographical isolation, and (d) limited course offerings (Clark, 1989). Beginning in the 1930s, distance education delivery systems branched out from correspondence education to include radio and television. Radio, as a delivery system for distance education, failed to gain the momentum it required to become an effective and lasting force in education. The reasons identified included: (a) difficulties with money and hardware (no or poor equipment, inadequate reception), (b) program content not matching the needs of schools, and (c) scheduling difficulties. Another reason given was educators being disinterested and apathetic toward this revolutionary means of communication. A final reason was the fact that schools were slow to act upon the technological changes in society (Cuban, 1986).

By the 1950s, television had replaced radio as a medium for the delivery of distance education. Cuban (1986) identified three different patterns of usage of broadcast instructional television in schools. First, the entire educational program was presented by a television teacher. The classroom teacher assumed the position of a supervisor for large or small groups of students. Second, broadcast instructional television was utilized as a supplement to classroom instruction by the teacher. The classroom teacher prepared his or her class to receive instruction from the television teacher and was responsible for follow-up activities. Third, the classroom teacher utilized broadcast instructional television as an aid to the learning process in a manner similar to films. The teacher decided when and how to allow televised instructional programs into the classroom.

Since broadcast instructional television was introduced, people have been concerned that instruction via television was as effective as instruction delivered in a traditional classroom. Teachers in general are slow to adapt to technological changes in their classrooms. Other instructional tools, such as textbooks and chalkboards, are easier for teachers to use in dealing with the everyday problems found in the classroom. Another reason teachers are slow to adapt to technological changes is that many teachers believe these changes affect the relationships between teachers and students necessary for student learning (Cuban, 1986).

Research is being conducted on a variety of issues associated with distance education. Many factors must be looked at, including the quality of interaction among students and teachers (Office of Technology Assessment, 1989). Teachers are worried about the quality of interactive television instruction, as well as the need for interaction with all of the students, particularly those at the remote sites. Interaction has been considered one of the two main stages of teaching. Interaction is when the teacher provides verbal stimulation, gives explanations, asks questions, and gives guidance (Giltrow, 1989). One weakness of televised instruction in the past has been the lack of interaction. This type of instruction tended to separate teachers from students and students from other students (Chung, 1991). Distance educators have discovered that they need to create an interactive environment appropriate for the technology to aid in keeping the students' attention. Johnstone, cited in Office of Technology Assessment (1989), found that:

> The best way to learn new information is to receive it while in an active, rather than passive, state of consciousness....One simple method the instructor can use to assist the learner...is to do something that is never done on broadcast television: to talk directly to the distant learner and require a response at the very beginning of the session (p. 93).

Distance educators can also facilitate learning by giving students opportunities to interact with other students and relate new information to prior understanding and knowledge (Office of Technology Assessment, 1989).

Therefore, an important issue to consider as distance education programs are developed is the identification of effective methods in the interactive television classroom which promote students' active involvement with their own learning. As they prepare to deliver instruction through interactive television, teachers have requested help in identifying ways to promote active student involvement in the learning process (Office of Technology Assessment, 1989). Crow, as cited in Eble (1980), stated that research into the interactive processes supports a number of conclusions, including: (a) students become active rather than passive participants in the learning process, (b) students retain the information longer, and (c) the instructor is able to receive informal feedback about the progress and attitudes of the students throughout the semester.

Purpose

The purpose of this study was to survey teachers and students in interactive television courses at an Iowa high school. The questionnaire was administered to determine if instructional methods teachers identified as most effective in promoting students' active involvement in learning were perceived in this same way by the students in their distance education classrooms. The information gathered will be useful for distance teachers in developing teaching activities that promote active student involvement.

Question

Do high school students' perceptions of effective instructional methods for promoting active student involvement within the interactive instructional television classroom differ from their teachers' perceptions of effective instructional methods?

Significance

Learning is an active and dynamic process with important components being communication and interaction. It can be both an individual as well as a group experience (Herring, et al., 1993; Willis, 1992). In order for learning to occur, students need educational environments that are creative and responsive to their needs. Using distance learning systems to deliver instruction can change the communication and interaction patterns between teachers and students. However, when special efforts are made by teachers to involve learners in classroom interactions, differences between traditional and distance education classrooms diminish. Distance education can actually improve learning experiences, broaden horizons, and promote group collaboration by exposing students to ideas, activities, and people not available in their schools.

A limited amount of research has been done on distance learning through interactive television. Much of this research has been done in higher education (i.e., community colleges and universities). Little of the research has been done at the high school level. As a result of the Star Schools grant, many high schools in Iowa now have the opportunity to provide additional courses for their students through interactive television. Most of the teachers for these courses will be coming straight from the traditional classroom setting. These teachers have little, if any, experience with teaching over interactive television. Therefore, it is important for these teachers to understand what their students perceive as effective teaching strategies for promoting active involvement in their own learning within the interactive television classroom. Based on their students' perceptions, teachers can adapt, if necessary, their teaching style to enhance interactive instructional television.

Limitations

This study was limited to students in high school courses taught by high school teachers in Iowa. Three classes consisting of 44 students and three teachers participated in the study. Only distance education courses that used two-way video and two-way audio were included.

Method

Sample

The population was comprised of high school teachers and their students in the State of Iowa participating in interactive instructional television courses that utilized two-way video and audio communication. The teachers and their classes were identified with the assistance of the Iowa Star Schools Regional Coordinators. Of the 11 teachers identified, three chose to participate in the study. All three were experienced teachers in the traditional classroom; two had taught for more than twenty years. None had previously taught an interactive television course. Of the 44 students in the study, the majority were juniors and seniors in high school who considered themselves "A" or "B" students. Ninety-one percent of the students were participating in their first interactive television course. Eighty percent were considering continuing their education at either a two- or four-year college.

Instrument

A questionnaire was designed to gather data about teacher and student perceptions concerning methods for promoting active student involvement within an interactive television course. The instrument was divided into two main sections. Part I measured teacher and student perceptions of methods for promoting active student involvement. Teachers and students were asked to respond to each statement using a Likert Scale of "1" to "6", with "1" representing strong agreement and "6" representing strong disagreement. The variables were: (a) use of technology, (b) classroom management, (c) communication patterns, and (d) teaching habits.

Part II collected demographic information. The variables for the teachers were: (a) teaching experience in a traditional classroom, (b) teaching experience in an interactive television classroom, (c) time of class, and (d) type of system used. The variables for the students were: (a) year in school, (b) type of student, (c) experience with interactive television courses, (d) subject of the course, (e) grade expected in the class, (f) time of class, (g) future plans, and (h) who influenced them to take the course.

The instrument was developed using questions from surveys of other interactive television courses identified during the review of the literature. The initial questionnaire was evaluated by a group of people experienced with either distance education or research. This group included: (a) Sharon Smaldino, Associate Professor at the University of Northern Iowa, (b) Robert Hardman, Professor of Education and the Director of the Center for Educational Technology at the University of Northern Iowa, (c) Terry Goro, Coordinator of Instructional Technology Services at the Center for Educational Technology at the University of Northern Iowa, (d) Carmen Montecinos, Assistant Professor at the University of Northern Iowa, and (e) Chris Sorensen, Evaluation Specialist at the Research Institute for Studies in Education at Iowa State University. The questionnaire was adapted according to their suggestions.

The questionnaire was sent to the teachers and the classroom facilitators at the remote sites. A cover letter gave directions so that the questionnaire was administered under nearly identical conditions at all of the locations. The students were assured of their anonymity and that they could decline to participate in the study. Time was given in class to complete the questionnaire. Questionnaires were then collected by the teachers and classroom facilitators and returned to the researcher.

Conclusions

Demographics

The survey indicated that the majority of teachers and students were experiencing interactive television for the first time. This agrees with the statements in Willis (1992). This was a new environment for learning—one which was unfamiliar to both the teacher and student. According to Willis (1992), teachers need to create an environment that encourages students to become involved in the learning process.

Technology

This section of the questionnaire dealt with teacher and student perceptions about the role technology plays in enhancing participation in a distance education class. The data suggest that both teachers and students hold favorable attitudes concerning technology use as a means to enhance student involvement in a distance education class. In fact, only two percent of the students surveyed disagreed with the statement that technology use by students encouraged participation in class. Both Rezabek (1988) and Willis (1992) suggested that teachers need to be comfortable with using technology. Willis (1992) noted that communication between teachers and students will be inhibited until they become accustomed to using the delivery system. If communication is inhibited, participation in class will also be inhibited.

Classroom

This section of the questionnaire dealt with three aspects of classroom management: (a) keeping students on task, (b) having a well organized class, and (c) clearly identifying teacher expectations of students. Two-thirds of the teachers and 80% of the students agreed that keeping students on task enhanced student participation in class. It is interesting to note that while 12% of the origination site students disagreed with this statement, 26% of the remote

BEST COPY AVAILABLE

site students disagreed. Remote site students may appreciate the less restrictive learning environment that may occur when the teacher is not physically present in the classroom.

Both teachers and students agreed that well-organized classes and clear expectations of student behavior were important. In fact, only four percent of students disagreed that well organized classes were important. These results support characteristics of effective teachers in traditional classrooms identified by Borich (1992), Brophy (1992), Heroman (1990), and Porter and Brophy (1988). The Office of Technology Assessment (1989) and Rezabek (1988) suggest that teachers in a distance education class use the same techniques that have proven effective in the traditional classroom.

Communication

This section of the questionnaire dealt with communication patterns that promote active student participation in distance education classes. All of the teachers and students surveyed agreed that an enthusiastic teacher who demonstrated a sense of humor at appropriate times enhanced student involvement in the class. This agreed with characteristics of effective teachers identified by Langlois and Zales (1992) and Weaver II (1993). The results also agreed with the conclusions concerning important teleteaching behaviors identified by Chung (1991), Egan (1991), Hardman (1993), Massoumian (1989), and Office of Technology Assessment (1989).

Teachers and students agreed that it was important for a teacher to create and maintain eye contact with students while talking to them. This agreed with effective actions identified by Egan (1991), Hardman (1993), and Rezabek (1988). Teachers and students also agreed that it was important for teachers to address students by name. This agreed with conclusions drawn by Office of Technology Assessment (1989) and Willis (1992). However, results indicated it was not as important for students to identify themselves when speaking. In fact, only 24% of all students considered this important. This suggests that as teachers and students get to know each other better, they learn to recognize each other's voices and formal identification is not necessary. This contradicts a suggestion offered in Hardman (1993) that students should identify themselves when speaking.

The teachers and the majority of students agreed that timely feedback from the teacher was important. Only 20% of students disagreed with this statement, supporting conclusions found in Chung (1991). The response also agreed with characteristics of effective teachers in traditional classrooms identified by Borich (1992) and Heroman (1990), as well as techniques for promoting participation identified by Morgenstern (1992) and Smaldino (1992).

Nearly all of the teachers and students believed that it was important that there be opportunities to ask questions and communicate with the teacher as well as other students during class time. This agreed with conclusions drawn by Massoumian (1989), Office of Technology Assessment (1989), Rezabek (1988), and Willis (1992).

Teaching

This section of the questionnaire dealt with specific teaching habits for promoting active student involvement within a distance education classroom. The teachers and the majority of the students agreed that it was important to begin each class with a review of the previous class session. Only 25% of the students disagreed with this statement. However, the teachers and students felt it was more important that the objective of each class be identified at the start of class. This agrees with methods suggested in Borich (1992), Hardman (1993), and Smaldino (1992) to promote interaction in a classroom. It also agrees with characteristics of effective teachers identified by Borich (1992) and Smaldino (1992).

All the teachers and 89% of the students felt it was important for teachers to summarize information before moving on to new concepts. This result supports conclusions drawn in Chung (1991).

All the teachers and the majority of students agreed that the teachers should instruct the class at an appropriate level of difficulty and use appropriate pacing during instruction. Only 10% of the students disagreed with these statements. These results support suggestions found in Egan (1991), Rezabek (1988), and Willis (1992).

It was interesting to note that the majority of teachers and students agreed with the statement that large group instruction promoted student participation in a distance education class. This contradicts suggestions offered by Hardman (1993) for teaching styles that promote interaction.

All of the teachers, as well as 84% of the students, felt that it was important for teachers to vary learning activities within a single class. It was interesting to note that remote site students felt more strongly about this statement than did the origination site students. In addition, all the teachers and students felt it was important for the teacher to encourage student participation in class activities. These results agreed with suggestions for effective teaching in a distance classroom found in Hardman (1993), Klinger and Connet (1992), Office of Technology Assessment (1989), and Rezabek (1988). These results also agreed with suggestions for effective teaching habits in a traditional classroom found in Borich (1992), Heroman (1990), and Morgenstern (1992).

All of the teachers and 96% of the students agreed that when teachers use a variety of visual materials, involvement in class is enhanced. This agreed with statements found in Hardman (1993), Office of Technology Assessment (1989), Rezabek (1988), and Willis (1992). It was interesting to note that more students than teachers agreed with the importance of providing handouts for each class. These results, however, support suggestions found in Egan (1991) and Hardman (1993).

Seventy-one percent of the students and all of the teachers felt it was important to allow time in class to work on assignments. This agreed with suggestions for effective teaching in the traditional classroom found in Hardman (1993) and Smaldino (1992). It was interesting to note that remote site students felt more strongly about this than origination site students, suggesting that they may desire the opportunity to get assistance from the teacher, if necessary, on their assignments. Getting assistance from the teacher outside of class time may be difficult if not impossible for remote site students.

Recommendations

The results of this study suggest that high school students' perceptions of effective instructional methods for promoting active student involvement within the interactive television classroom agree with their teachers' perceptions of effective instructional methods. The results also indicate that many of the teachers are knowledgeable about effective teaching practices in the distance classroom.

An origination site student stated that students won't participate in class until they feel comfortable doing so. A remote site student offered a solution to this problem, suggesting that the first class should be organized to allow students to get acquainted with each other so that they won't be afraid to offer comments. If this feeling of comfort were established early in the class, one barrier to interaction would be removed.

Another remote site student stated that participation in class would be enhanced if the teacher attempted to involve all sites equally. This would lessen the feeling of social isolation evident in some remote sites.

This study asked if teachers and students felt that the practices identified in the questionnaire would be effective in promoting interaction in the distance education classroom. The study did not ask if the teachers actually utilized the teaching practices identified. Another recommendation would be that teachers incorporate these practices into their distance education classes if they are not already present.

This was a pilot study concerning teacher and student perceptions and did not address factors that affected the development of those perceptions. Further research to identify these factors is recommended. Areas to consider include how the school atmosphere and size of the class affect the communication patterns of teachers and students. Further research should include interviews with teachers and students to identify effective instructional methods for promoting active student involvement in a distance education class.

References

Borich, G. D. (1992). Effective teaching methods. New York: MacMillan Publishing Company.

Brophy, J. (1992). Probing the subtleties of subject-matter teaching. Educational Leadership, 49(7), 4-8.

Chung, J. (1991). Televised teaching effectiveness: Two case studies. Educational Technology, 31(1), 41-47.

Clark, C. (1989). Distance education in United States schools. The Computing Teacher, 16(6), 7-11.

Cuban, L. (1986). Teachers and machines: The classroom use of technology since 1920. New York: Teachers College Press.

Eble, K. E. (1980). Improving teaching styles: New directions for teaching and learning. San Francisco, CA: Jossey-Bass Inc.

Education Satellite Network. (1994). Distance learning primer. St. Louis, MO: Missouri School Boards Association.

Egan, M. W. (1991). Effective television teaching: Perception of those who count most--distance learners. (ERIC Document Reproduction Service No. 342 579)

Feasley, C. E. (1983). Serving learners at a distance: A guide to program practices. ASHE-ERIC Higher Education Research Report No. 5. Washington, DC: Association for the Study of Higher Education.

Garrison, D. R. (1989). Understanding distance education: A framework for the future. London: Routledge.

Giltrow, D. (1989). Distance education. Presidents' Library, 1(1), 1-83.

Hardman, R. (1993). Interactive television workshop. Cedar Falls, IA: Center for Educational Technology, University of Northern Iowa.

Heroman, D. S. (1990). Student perceptions of the learning environment assessments of teacher performance and student learning. (ERIC Document Reproduction Service No. 338 356)

Herring, M., Smaldino, S., Thompson, A., & Schoenfelder, K. (1993). Interactive television preservice resource guidebook. Cedar Falls, IA: Center for Educational Technology, University of Northern Iowa.

Klinger, T. H., & Connet, M. R. (1992). Designing distance learning courses for critical thinking. T.H.E. Journal, 20(3), 87-90.

Langlois, D. E., & Zales, C. R. (1992). Anatomy of a top teacher. The Education Digest, 57(5), 31-34.

Lappia, A., & Kirkland, J. (1989). Audio-cassette tapes in distance teaching: Student evaluation. Distance Education, 10(2), 277-284.

Massoumian, B. (1989). Successful teaching via two-way interactive video. Tech Trends, 34(2), 16-19.

Morgenstern, L. (1992). Action and inaction: Student and teacher roles in classroom participation. (ERIC Document Reproduction Service No. 346 534)

Office of Technology Assessment. (1989). Linking for learning: A new course for education. Washington, DC: U.S. Government Print Office.

Porter, A. C., & Brophy, J. (1988). Synthesis of research on good teaching: Insights from the work of the Institute for Research on Teaching. Educational Leadership, 45(8), 74-85.

Rezabek, R. (1988). Teleteaching handbook: A handbook for teachers using microwave or ITFS. Fort Dodge, IA: Arrowhead Area Education Agency Media Services Division.

Schlosser, C., & Anderson, M. (1993). Distance education: Review of the literature. Ames, IA: Research Institute for Studies in Education.

Simonson, M., Sweeney, J., & Kemis, M. (1993). The Iowa Distance Education Alliance: Star schools: A special statewide network. Tech Trends, 38(1), 25-28.

Smaldino, S. (1992). Instructional development guidebook. Cedar Falls, IA: Center for Instructional Technology, University of Northern Iowa.

Stahmer, G. (1990). A survey of students currently enrolled in IITV courses in community colleges in Iowa. Unpublished master's thesis, University of Northern Iowa, Cedar Falls, IA.

Verduin, J., & Clark, T. (1991). Distance education: The foundations of effective practice. San Francisco: Jossey-Bass Publishers.

Weaver II, R. (1993). What makes a teacher dynamic. The Education Digest, 58(9), 31-33.

Willis, B. (1992). Making distance learning effective: Key roles and responsibilities. Educational Technology, 22(6), 35-37.

The Iowa Communications Network as a Vehicle for the Delivery of Applied Instrumental Music Instruction

Donald Simonson
Iowa State University

Introduction

Each fall more than 12,000 Iowa high school musicians begin their preparations for the annual All-State Music Festival. The auditions, held usually in late October, reduce the ever-increasing number of would be All-Staters to a nearly manageable 1,200 performers; 600 in the chorus, and 300 each in the band and orchestra. For more than half of the students, assistance is only as far away as their choral or instrumental director. For the remainder, those who play instruments that their directors are only passingly familiar with, if at all, help is much farther afield. Those students are often left to fend for themselves to gain the necessary expert instruction on their particular instrument. For those living within one of the state's metropolitan centers or near a college or university, expert teachers are easily available, although costly. For the remainder, the vast majority in largely rural Iowa, access is a practical impossibility, and their opportunity to develop the necessary musical and technical proficiencies is severely curtailed.

For many years, the music faculty of Iowa State University (ISU) has, as part of its land-grant mission, worked to provide access and assistance to those talented and deserving students and their directors. Initially, ISU's assistance took the form of on-site masterclasses and clinics. While effective in addressing the needs of the students, on-site activities were exceptionally time intensive, requiring release time for travel, and were often difficult to coordinate to bring sufficient student numbers to a central site to reach critical mass. Consequently, the demand for masterclasses and clinics easily outstripped the faculty's available time. To supplement the masterclasses and clinics, the department began producing and distributing audio tapes containing the required All-State etudes or exercises for each instrument as performed by ISU faculty. The audio tapes provided examples of proper performance of audition etudes for students to use as a guide and reference point for their own preparation. Again, the methodology proved effective as far as it went, but it fell short in addressing each student's unique needs and aspects of individual application.

With the advent of the Iowa Communications Network (ICN), the state-owned fiber optic transmission system linking, ultimately, every school district in Iowa, an answer to the shortcomings of the previously employed methods seemed at hand. The ICN offers real-time, two-way fully interactive audio and video. Because each classroom connected to the system must meet specific equipment requirements, a relatively high standard of transmission quality is assured. Whether this quality standard was sufficient for the subtleties of musical nuance remained to be seen. A number of more practical concerns required attention first.

Our first concern, that of whom were we trying to reach, was easily addressed—Iowa high school students auditioning for All-State. Next we needed to determine the instruments for which we would offer masterclasses. To test the functional range of the delivery system, we wanted to employ a variety of instrumental timbres, intensities, and frequency ranges. We finally settled on clarinet (higher harmonics, low to mid-level of intensities, mid-high frequency range), trombone (lower harmonics, mid- to high-intensity, low- to mid-frequency), and percussion (including the timpani, marimba, snare drum, cymbal, and tambourine, and encompassing the extremes of timbre, intensity and frequency range). Our last concern, when to offer the masterclasses, was dictated by the All-State schedule, the availability of faculty members, and the availability of the University's ICN classroom as an origination site.

To reach our target audience and inform them of the availability of our masterclass series, all instrumental music directors (both band and orchestra) in those cities with a fully functional ICN site were faxed a letter of explanation and a Masterclass Registration Form. At that time (mid-Septem-

BEST COPY AVAILABLE

ber, 1993), 44 sites were reported to be fully functional, providing 77 secondary school music programs with access. The registration form asked each director to indicate which masterclass sessions they wished to participate in and to provide the names of those participating (including administrators, faculty, and students). They were also asked to contact their district's ICN coordinator or Star Schools representative to reserve their ICN classroom for the appropriate days and hours. Each director was asked to then return the completed registration form as soon as possible, and not later than October 4. It was at this point that the reality of our efforts became much more exciting.

In less than 24 hours, the registrations were being returned, and directors were calling to request further information. Within 48 hours Iowa Public Television (IPTV) was calling to inquire as to what we were up to (the origination of and access to any ICN transmission is programmed at IPTV in Johnston, a suburb of Des Moines). It seems that ICN coordinators from interested sites were calling IPTV to arrange to receive the transmission instead of returning their registration forms as requested and leaving those arrangements to us. At first blush it seemed that we had created our own little Iowa cyclone of confusion, but due to the fact that this was the first undertaking of its kind we realized that everyone's confusion was the result of a lack of experience and was just part of "working out the bugs." In any case, in short order our efforts were coordinated and we got down to the business of final transmission preparations.

Over a three-day period in October, 1993, masterclasses were taught by David Stuart, Associate Professor of Trombone; Joseph Messenger, Professor of Clarinet; and Barry Larkin, Assistant Professor of Percussion. On the Friday prior to the first masterclass, a tour of ISU's ICN classroom was arranged for the three faculty presenters. Their major concerns focused on the 'how to' of the system. Through the guidance of Matt Darbyshire and his assistants, their fears were assuaged and the discussion moved on to the mundane issues of where they should stand, where their music stands should be placed, and the like. The final concern was that of the musical fidelity of the transmission. The staff had informed us that the audio portion of the signal was compressed and that dynamic variations could possibly be compromised given the system's technical and hardware limitations (the microphones were designed primarily for speech transmission and the speakers in the video monitors were not of stereo or hi-fi specification). While this particular aspect was one of great concern, the masterclass presenters seemed challenged to overcome any negative effect.

As the transmission of our first masterclass approached, David Stuart, the trombone teacher, busied himself with last minute details. Stuart, an active guest clinician and performing professional musician, felt an informal approach would be most conducive to the creation of an atmosphere in which faculty and students alike would feel comfortable while confronting a new technology. Within minutes of beginning his presentation, the more than 30 students and faculty participating in his masterclass were freely communicating like old pros at two-way interactive television. Stuart, controlling the topics and direction of the masterclass, moved easily between lecture and demonstration.

Three area trombone students also served as guinea pigs, demonstrating the required All-State etudes and scales. Questions from the receiving sites flowed freely, and before long, Stuart and students at the remote sites were listening to a student try her hand at a mock All-State audition. More questions and demonstrations followed, and before we knew it our reserved time was up and we had to sign off.

In a brief informal post-masterclass meeting including all of the faculty and production staff, we reviewed the experience in an attempt to fine-tune the process before the next masterclass of the series. To our surprise, we agreed that it had been remarkably smooth and that even our concern over the quality of the audio signal was, for now, a non-issue. Returning to my office about an hour later I was pleased to find two messages on my answering machine from directors who had just participated in the trombone masterclass. Both could hardly contain their excitement over the quality of their students' and their own first experience with this new distance education technology.

The clarinet masterclass followed very much the same format as the trombone session with the addition of another 40 participants and extended the transmission of our signal from the Missouri river on the western border of Iowa to within 30 miles of the Mississippi (from Sioux City in the west to Maquoketa in the east). While Joseph Messenger's style differed from Stuart's in matters of presentation, his expertise came across easily. Again the concern over the audio transmission proved insignificant and, in fact, it seemed that as the session progressed the quality of the audio signal improved. This was doubtless a psycho-acoustic adjustment of the hearing mechanism and a reaffirmation of the adaptability of the human mechanism to its environment.

As the session progressed, Messenger's teaching became more and more detailed and subtle in its focus. The questions dealt to a greater degree with issues of minute nuance. As student after student performed for Messenger and each other over the ICN, a true appreciation of the ICN's potential became evident. Not only was it possible for Messenger to teach at a level of individual subtlety heretofore unknown outside of the music studio, he was able to use each student's unique skills and talents, as well as their shortcomings, to effect a learning synthesis unique to group interaction. All this occurred with the individuals scattered across an incredibly large geographic area. In another post-masterclass briefing, the verdict was unanimously positive. Comments from participants continued to overwhelmingly support that conclusion.

The last session of our masterclass series proved to be, as was expected, the most thorough test of the technology. It also required the greatest amount of preparation with respect to props, equipment and stage setting. While a trombone can be an unwieldy instrument, its space requirements can be easily accommodated in even the most confining of rooms. On the other hand, three timpani, a marimba, a snare drum and various other percussion instruments, mallets, sticks and music stands require a tremendous amount of space. To cover this large space, the camera angles needed to be readjusted and special moveable microphones had to be employed. With ISU's flexible and capable technical staff, the necessary physical adjustments were easily accomplished.

Because the receiving sites needed the same variety of instruments for student participation, a somewhat smaller registration was expected. Our registration included six sites with a total of 21 faculty and student participants. Barry Larkin, the presenting percussionist, wanted to encourage as much participation and interaction as possible.

With the first distant site performance, the audio signal finally became the concern we had feared. As soon as the student from Maquoketa began to play the timpani, the audio quality deteriorated to a raucous, indistinguishable rumble. After a quick consultation with the staff, a possible technical solution to the problem was offered. Try moving the microphone further away from the timpani! With two attempts the perfect distance was achieved and the audio quality was re-established. This pattern was repeated for nearly each change of site and each change of instrument. While definitely low-tech, it was a functional solution to the problem. As was the case in the previous sessions, Larkin was able to address issues of surprising subtlety and, in doing so, effect a remarkable amount of positive change.

Unique to the percussion masterclass was the manner with which Larkin relied on the visual image as a diagnostic aid for discerning poor or potentially harmful muscular function in the participating students. Working with the subtleties of grip tension and wrist flexibility, Larkin made immediate and easily recognizable changes in the participating students' performance. These changes were noticed not only by the faculty members but also by the students, again providing the raw material for synthesis and learning.

Having completed our series of masterclasses, the process of evaluating the effectiveness of the ICN as a delivery system for teaching applied instrumental music remained. The evaluation process consisted of a brief follow-up survey which was distributed to each of the participating instrumental music directors and clinicians. Of the 17 participants, 15 responded and completed the survey. The responses are included in Appendix A.

The survey responses, which were overwhelmingly positive, affirm the effectiveness of the ICN as a delivery system for applied music instruction. Participating school music teachers are convinced that the ICN can positively affect the performance of their instrumental music students. The ISU faculty clinicians are also convinced of the ICN's potential as an educational aid. In fact, at the present time plans are being developed to offer a series of masterclasses for instrumental and vocal students preparing for Iowa's spring solo music contests. In addition, a number of music faculty are investigating possible continuing education workshops or classes directed to the needs of public school music teachers. In short, a negative word has yet to be spoken about the ICN. From the musicians' point of view, it is a technology to be embraced, explored, and exploite to increase and broaden the impact and reach of our art.

Appendix A. ICN Masterclass Survey

1. Before your ICN Masterclass experience, had you thought that teaching applied music was a possible use for the ICN?

yes (7) no (8)

2. If you answered no, why?

Wasn't aware of the technology	(2)
Assumed the ICN wasn't suitable for music transmission.	(1)
Thought of the ICN as a visual medium not an aural medium.	(1)
Thought of the ICN as a classroom, lecture type system.	(1)
Just didn't think of it.	(2)
No reason or response given.	(1)

3. What did you believe would be the greatest shortcomings of applied instruction over the ICN?

a.	Sound Quality	(8)
b.	Video Quality	(0)
c.	Ease of use	(6)
d.	Classroom/student management	(2)
e.	Interactivity	(4)
f.	Other (specify)	
	Expected system glitches and bugs common to new technology.	(1)

4. What were the greatest shortcomings of applied instruction over the ICN?

a.	Sound Quality	(5)
b.	Video Quality	(0)
c.	Ease of use	(2)
d.	Classroom/student management	(0)
e.	Interactivity	(1)
f.	Other (specify)	
	Lack of access to ICN classroom.	(3)
	Local ICN site used as a regular classroom, and in use.	(1)
	Assumed no shortcomings.	(4)

5. What did you believe would be the greatest benefits of applied instruction over the ICN?

a.	Access to experts	(11)
b.	Interactivity	(5)
c.	Ease of use	(2)
d.	Low cost	(1)
e.	Potential for increased input	(7)
f.	Other (specify)	
	Didn't know what to expect.	(1)

6. What were the greatest benefits of applied instruction over the ICN?

a.	Access to experts	(13)
b.	Interactivity	(6)
c.	Ease of use	(5)
d.	Low cost	(2)
e.	Potential for increased input	(8)
f.	Other (specify) *Ability to access other participating sites.*	(1)

7. Please rate the following on a scale of 1 (low quality) to 5 (high quality).

		Mean Score
a.	Speech sound quality	4.2
b.	Music sound quality	3.9
c.	Overall sound quality	4.1
d.	Video quality of media and music	4.7
e.	Video quality of instructor/student performances	4.8
f.	Overall video quality	4.8

Please rate the following on a scale of 1 (difficult) to 5 (very easy).

g.	Ease of use as a passive participant	4.3
h.	Ease of use as an active participant	4.7
i.	Overall ease of use	4.5

8. Compared to other forms of distance education delivery, how would you rank the effectiveness of the ICN ?
[On a scale of 1 (not effective) to 5 (highly effective)]

4.7

9. What was your expectation of the effectiveness of applied music instruction over the ICN?
[On a scale of 1 (not effective) to 5 (very effective)]

3.7

10. Based on your experience with the All-State Masterclass Series, how effective is applied music instruction over the ICN? [On a scale of 1 (not effective) to 5 (very effective)]

4.6

11. How likely are you to participate in future ICN applied music masterclasses?
[On a scale of 1 (not likely to 5 (very likely)]

5.0

Teaching Science at a Distance: The Teacher's Perspective

John W. Tillotson
Laura Henriques
University of Iowa

Introduction

In the past century, the world has witnessed major advances in the development of communications technology. The impact of these developments has been dramatic in the field of education. Innovations in communications technology have led to the creation of distance learning programs at all levels of schooling. Jefferson and Moore (1990) report that many states with rural districts, lacking properly trained teachers in subjects such as mathematics and science, look to distance education systems as a way to fill these voids.

While this new technology offers vast potential, it also brings with it a host of considerations for the teachers who use it. Stern (1987) points out that the availability of distance learning technology requires that teachers have an awareness of necessary skills to reach the distant learner. Teachers using distance education technology face a variety of challenges as they try to adapt their teaching styles to a framework compatible with such an environment.

Past research studies indicate that the success or failure of a telecourse depends most heavily on the quality of the instructor (Chung, 1991). Teachers in all settings share similar responsibilities for planning, preparation, delivering instruction, and assessing students. However, as Carl (1991) points out, some educators have reservations that distance courses would add significantly to a teacher's already heavy workload. This results from larger class enrollments, the need to plan well in advance, and other considerations related to this mode of instruction.

Research done on the comparisons between traditional classroom instruction and distance courses finds no significant difference in student achievement (Chung, 1991). Closer examination reveals that few of these studies deal specifically with science courses which are, by their nature, different from other subjects. In particular, teachers of science face perhaps unique obstacles as they try to incorporate the laboratory experience into their distance courses (Mugridge, 1991).

In order for distance education to be accepted as a viable method of instruction, a concerted effort must be made to address the concerns and needs expressed by the teachers using the technology.

Statement of the Problem

The primary aim of this study was to amass information concerning the impact of distance teaching on science teachers who use it as a means of delivering instruction. In any telecourse, the teacher plays a pivotal role in determining how effectively the technology is used and whether or not it results in successful student outcomes. Science teachers encounter additional responsibilities when compared to teachers in other subjects considering the specialized facilities and laboratory equipment that are often used in science courses. This factor could conceivably make science the most challenging subject to be taught at a distance. Thus, science teachers' attitudes and perceptions toward the use of distance education technology may be the most informative about how widespread its acceptance is within the educational community.

It is this rationale on which the present study was based. More specifically, the purposes of this study were to determine the effectiveness of any training that the teachers received relating to the technology before using it, as well as the types of ongoing support they received while teaching these courses. Also of major interest in this study were the comparisons teachers made between their distance science courses and their traditional ones in regard to pedagogical considerations, student outcomes, and human interaction aspects. Finally, this study gathered data on science teachers' perceptions of the viability of distance education technology as a means of delivering science instruction relative to its potential benefits and limitations.

Design and Methodology

The research design used in this qualitative study consisted of five individual case studies of distance education science teachers in the state of Iowa. The conceptual framework utilized was based on the perceptions of these teachers with regard to their experiences as distance educators in science. With the exception of one respondent, the data collection process consisted primarily of in-depth interviews conducted via telephone. While face-to-face interviewing would have been preferred, the considerable distances separating the researchers and respondents made this option unrealistic. The opportunity for participant observation of actual distance science classes in progress was similarly precluded because of the distances involved. As a result, only one teacher, who was located nearby, was observed.

The researchers carried out each science teacher interview using an interview schedule that was developed for the purposes of this study. In all, five teachers were asked about their experiences using distance education technology to deliver science instruction. The teachers selected were randomly chosen from a list of potential candidates who were teaching a distance science course. This list was compiled by contacting the Regional Coordinators of the Iowa Distance Education Alliance, who provided the names of any such individuals in their area. The teachers, randomly selected from the list, were contacted by the researchers and their interviews were audio taped and later transcribed. Their collective responses were coded into categories that emerged from the data they provided and the analysis was carried out using Glasser and Strauss' constant comparative method (Glasser and Strauss, 1967). The data for this study were collected between September 1993 and September 1994.

Results

The researchers asked respondents to describe their experiences related to teaching a science course over a distance education system. The respondents shared their thoughts on topics such as the training they had received concerning the use of the technology and any additional training they felt would have been beneficial. Regarding actual teaching considerations, the respondents provided extensive information on the comparability of distance education versus traditional science instruction on a wide range of issues. Data pertaining to the technical aspects of the technology and support personnel available to them were also gathered. Finally, the respondents offered their opinions on the viability of distance education technology for delivering science instruction.

The following sections summarize the findings of this study with each set of propositions being grounded in the data garnered from these five case studies. Quotations are occasionally paraphrased to avoid identifying a particular respondent and to insure the confidentiality of all responsents. The quotations included are representative of the responses given on the stated topic.

Teacher Background

The respondents in the interview pool were an experienced group of teachers, averaging 17.4 years of teaching experience, with 2.8 of those years being in a distance education setting. Two-way interactive teaching experiences ranged from two weeks to eight years. The classes were being delivered to an average of four remote sites. The number of students involved in the classes, however, varied dramatically, from a low of four remote students to a high of 45 students at a distance. Most teachers were teaching on the system voluntarily, although two-way interactive teaching is not necessarily their preferred mode of instruction. Some courses were only being offered in a distance education setting, which meant that if a teacher wanted to teach that particular class, he or she would have to 'volunteer' to teach it at a distance. One respondent had a small monetary incentive to teach via the system.

The types of systems used by the respondents varied. Some taught on a fiber-optic system and some taught on microwave systems. Both types of systems, however, are live, two-way, and interactive. In all cases, students can speak to the instructor by depressing a button on their microphone. Teachers can control the camera shot, zoom in and out, and use an overhead camera and other audio-visual equipment. In some cases the camera angles could be changed, but in most cases the camera was fixed. The respondents had taught a variety of classes in the distance education setting.

Inservice and Preservice Components

Most of the respondents had engaged in training activities prior to teaching in a distance education setting. While the perceived effectiveness of the inservice varied, all felt that the opportunity to try the system before teaching was very important. Some respondents participated in inservice training offered by their schools, while others had a one-on-one introduction to the system. Being able to practice teaching while operating the system seemed to be the most valuable training aspect.

Respondents were asked to describe the ideal inservice workshop for teachers new to distance education. All respondents said the inclusion of a hands-on, practice teaching component would be critical. In addition to practice, the workshop ought to incorporate a 'show and tell' of what the system can do while also addressing more mundane daily considerations.

> *I would show how you can demonstrate this and demonstrate that, use the computer, use models, and go back and forth and talk about some of my own experiences on it. Sort of have an experienced person talk to the folks about it and then have people at various sites and go at it and do a practice lesson on it. I think an inservice would involve some sort of discussion of the details and that's one of the things that's really important, the details, to make sure you work out this problem or that problem.*

The other component of the ideal workshop, the nuts and bolts of teaching at a distance, would address questions like these: How large to write so all students can see? What colors to wear so that you don't melt into the background? How much zoom is good? How do you turn it on? What do you do if the system's not on when you want it to be on? How do you plug in the microphone? What volume do you use? How do you go from one test site to another? The difficulties that are likely to arise while teaching at a distance should also be discussed, such as, "How can we encourage discussion to get participation of students?" Issues dealing with site monitors, handing back of student work, and test taking might also be part of the discussion.

Teachers' Attitudes and Perceptions Toward Using Distance Education Technology

There was some diversity of teachers' attitudes and perceptions related to distance learning technology prior to their actually teaching a course using it. Some respondents described their initial feelings about distance science teaching as ranging from mild apprehension and anxiety to "fear of looking like a fool" and "dislike of the idea." Yet, others were less intimidated to the point of being excited about the opportunity to teach in this setting. One respondent who had previously taught science courses using a videotaping procedure "wanted to be on [the new, live system] because of the improvement that it would make in the delivery of the course."

Most respondents expressed initial concerns about factors such as establishing rapport with students at the distant sites and their ability to use the teaching strategies common in their traditional classrooms. Of particular importance to these five teachers was the likelihood of being able to develop the "personal aspects" of classroom dynamics, such as "reading students' faces" to look for signs of understanding or confusion.

Many respondents worried about how they would make their distance science course as "informal" as they liked their classes to be. This issue was particularly relevant to being able to perform science demonstrations.

> *It seems like having a demonstration would kind of shift the focus off the instructor for a while and onto the phenomena....I feared that if the only technique that I had was my wit and my creative discussion abilities, then I might fall short.*

Despite the lack of uniformity in the teachers' initial feelings about having to teach science to distant learners, all of them expressed similar thoughts about it after having done actual distance teaching.

> *It is much like being a beginning teacher, the first time you go in [the classroom] is the scariest moment. Once you've succeeded after the first class, you take a deep breath and say 'Oh, we made it though that one,' and the next time it's a little easier.*

All of the respondents indicated that they felt more confident and comfortable teaching on the system once they had done it. They reported that once their initial feelings of nervousness were overcome, they became more concerned with "having a good lesson planned out" and "having good questions to ask." One respondent summarized this by saying that "the first ten minutes felt awkward, then the camera and technology became secondary."

Support Personnel

The role that support personnel play was key to a well run distance education experience. Each campus had a secretary assigned to take in papers, hand out papers, move them by mail, etc.

> *The person in charge has a secretary who will take care of mailing materials out and it's not real smooth in that that person is located in another building. Since I am one who likes to give assignments and grade homework, I have a lot of papers incoming and outgoing. I guess that is one kind of clumsy part of this arrangement.*

The papers collected by this support person had to be mailed or driven from remote sites to the instructor. Students often complained. A respondent told us "I got criticism today from a student asking 'where is my homework?' and I told the group it is in the mail."

Teachers giving daily assignments continually dealt with this time delay. Reviewing assignments in class was problematic because students at the sending site had their test/homework in front of them, while the students at remote sites did not get theirs for another week.

The support person also made sure that tests were monitored. This was a concern for instructors. Because it is dif-

BEST COPY AVAILABLE

ficult to see the remote sites well, there must be a great deal of trust in testing situations and the level of trust was not always there.

> *The idea of how do we give a test at one place as well as the other places at once and have the trust of the students that they won't cheat and be able to get the results back - the test back - so they can be corrected....We're still trying to work out the logistics of getting this done.*

> *I worry about the homework aspect and to some extent the testing. There's been some difference in how tightly the monitors monitor test taking. I've heard rumors that at some sites people get by with cheating on tests.*

Another aspect of having students at a distance was the difficulty of giving spontaneous quizzes or handouts. In order to get material to remote sites, the instructors must send papers in advance through the site monitors. While faxing is a possibility, the fax machines were often not secure and not in the same locale as the site monitor. As a practice, faxing was not encouraged.

In addition to site monitors, our respondents had access to technical support. This included technicians connecting computers into the system, work study students taping classes, and technology departments answering questions about the system.

Technical Aspects of Teaching at a Distance

The general consensus of the respondents was that you will make mistakes when teaching in a distance education setting, and the students will let you know. "The students will tell me if they can't hear and I look for the button." The technical aspects of teaching at a distance—the technology, the buttons, the microphones—were just a few more things to think about and worry about.

> *My fears were confirmed as far as the button pushing and making sure the camera is on the right place at the right time. I've made some mistakes and what I learned—and they warned us about this at the orientation, that we will make mistakes—is that the students will let you know. They'll say—we can't see what you're doing—or whatever. I feared it would happen and it did.*

> *Once in awhile you'll start talking about a topic and you will forget the camera's focusing on the overhead only and I can imagine the people at the other site probably are pretty sick of looking at a blank overhead.*
>
> *There is an added dimension to the teaching because you have to push buttons and look at some people on a television screen. And that is a little different from a regular classroom. I compare it in many ways to the difference between driving a car with an automatic transmission to driving a car with a stick. How the stick is an added dimension of having to shift here and there—a small change while still doing all the things that you did before. Teaching on the [system] is somewhat similar in that there is an added dimension of having to push buttons on a touch screen and look at the camera and the TV monitor while still having to do all the things that you did before. It took a few weeks to get used to that but once I was.... I didn't have to be thinking about it consciously.*

Teaching at a distance added responsibilities to the teacher. The respondents tended to agree that mastering the technology gets easier with time. While the technology made some aspects of teaching more complicated, it made others easier. The zoom capability of the camera allowed models to be seen more easily. Video recordings and computers were easier to use in the lecture. "Just plug it into the system and you're off and running." Some of the downsides of this technological classroom included "being tied to the microphone," having to stay in one spot so that buttons and cameras could be controlled. While models were easier to show, demonstrations were more difficult. The rooms were "...not science rooms. They're just blackboards and desks or tables." Writing for the overhead camera must be larger than normal in order to be seen. As a result, not as much information could be transmitted at a time. Remote site students' faces, on the other hand, were smaller and more difficult to see. Students needed to depress the buttons on their microphones in order to be heard.

> *They have to actually hold down the microphone [button] in order for me to hear them. My students at [the origination site], it's easy for them to talk to me and if they forget to push down the microphone [button] then the remote students are saying 'What did you say?' They can hear me talking but they may not be able to hear the other students.*

A concern voiced by many respondents was that students are reluctant to speak because of the button-pushing.

Comparisons of Distance Education Classes Versus Traditional Science Classes Regarding Teaching

The science courses taught by the teachers in this study were primarily lecture-based, with emphasis placed on classroom discussions. These classes were described as seldom having hands-on experiences associated with them.

In some cases, students were required to take a separate lab course in conjunction with the distance science course.

There was little discrepancy in the way these teachers taught in their distance course when compared with their traditional science classes. When respondents were asked to compare their courses, typical responses included, "I would say they are very similar; lecture-based with class discussion." Respondents who used demonstrations or hands-on materials stated that they "had to think about them in terms of how they would appear on the [technology] system."

One aspect of teaching referred to often was planning and preparation time. The respondents indicated that prior planning was essential in the distance courses, more so than in the traditional ones. None of them, however, complained of not having the necessary planning time available.

The most important planning consideration mentioned by the respondents was that of "preparing class materials to be mailed to the remote sites," and "planning how to deal with the lag time between receiving and returning student materials." Other respondents stated that the majority of their out-of-class time related to the distance science course was spent grading papers.

A key comparison identified by the respondents was that classroom interaction with students in the distance courses required additional effort on the part of the teacher. Frequently, this involved the use of questioning to initiate discussion.

> *I usually stop every so often during the lecture [in my distance class] and ask each specific site if they have any questions. I can make sure that if they are a little shy about asking questions that they will do it.*

Another respondent used a similar approach urging students to "share experiences they have had related to the topic of discussion with the class." In any case, the need to make an effort to ask more questions in the distance science classes was indicated by all respondents. One respondent had students at all the sites "wave to each other at the start of class so they kind of feel like they are together a little."

One area of central importance in comparing distance teaching to traditional teaching is the impact on a teacher's pedagogical approach. Teachers develop a set of instructional strategies that produce desired student learning outcomes. Respondents indicated that there were modifications that had to be made to accommodate teaching science at a distance. These ranged from having to "sit at the front of the room and not be able to move around because of the microphone" to having to "memorize the material to be presented the first day so I could do it without notes...and concentrate on the mechanics of the system." It became clear that respondents felt that they had to make few drastic changes in their pedagogical style to teach in the distance classroom beyond the ones described here. Also important was the fact that none of the respondents felt that their experiences teaching science at a distance had any effect on the way they taught their traditional science classes.

Respondents were asked to describe the goals they had for students in their science classes, both in the traditional classroom and in the distance class. Typical goals for these students included being able to apply the concepts and understand the content. Despite some variations in the actual goals deemed important by these teachers, respondents generally stated that "they would be exactly the same in both classes" and that "they are basically the same with little difference between the objectives I have for the TV class and the regular class."

A final comparison of distance science teaching with traditional teaching dealt with assessing student achievement and the attainment of the goals the teachers had for their students. The majority of respondents felt that the best measure of student learning was done through testing, homework, and quizzes. Also, respondents stated that regular attendance and class participation were sometimes used to evaluate students. The tests used by these teachers were described as primarily multiple choice, true/false, matching, and essay type examinations. The respondents indicated that there was little difference in the assessment of students in either setting.

Student Aspects of the System

A major concern of teaching at a distance was whether or not students could learn at a distance. Informal studies done by our respondents, and more formal studies done by their schools, would indicate that students in both settings do equally well. The learning experience for both, though, may not be the same. Because the teacher and the student are not in the same location, the level of control and interaction is changed. Respondents wanted all students to interact and they had mixed results.

> *I keep thinking, how can I get the people at the other sites to be more interactive. How can I make sure that they aren't being bored to death and that they're not going to fall asleep and I may not even see it if they don't fall over.... I guess some other thing that seems to pop up too is that students don't really want to use the buttons on the microphones. They feel kind of awkward.*
>
> *I think as far as student interaction, it's very similar—the two (live versus remote). I call on students, I ask for responses, they ask me questions, and I think there's as much student interaction.*

> *The discussion part of the class was hampered a bit because of the TV—students are reluctant to push the button on their microphone to speak. You would have to ask them why they are reluctant to do it. I think in a small classroom setting it is easier to just say a few words that come to you as opposed to [being on the system] where you have to lean forward, push on a microphone, look out and be aware that there is a camera watching you. It makes people more conscious of what they are doing perhaps. This is something they shared with me at the end of the course.*

> *It's hard to get the people at the off sites to interact much.*

> *I think there would be an inverse relationship. The smaller the class, the greater the participation that you get.*

Having students at a distance decreased the likelihood of one-on-one interaction. It took longer to get to know the students' names. Students needed to take more responsibility for their own learning because the instructor was not in the same room. As a result, students at different sites got different experiences.

> *The people in [the origination classroom] felt that the course they got was different than the class that some of the students at the remote sites got because they got to see me in person and hear me and pick up on things that people at the other sites did not.*

In spite of this difference, students seemed to have comparable success rates.

> *We've done some studies, at least the coordinator of the TV courses has, and published results of the studies. He's found the grade point average for courses students have taken on TV is no lower than the grade points for people who take it live. I haven't done a study myself, in my courses. Just from a casual observation of success, I find that to be the case. It's no better; it's probably not worse than the live instruction.*

Another factor in student success was "the type of student" enrolled in the course. Many of the students taught by our respondents were non-science majors or students returning to school. These students, it was reported, tended to have more difficulty with science classes regardless of the mode of instruction. No difference in performance was noted.

Teachers' Thoughts Concerning Distance Education as a Medium of Instruction

When considering their impressions of distance education technology being used to deliver science instruction, respondents' statements fell into three main classifications. These included the perceived benefits and limitations of the technology, modifications that could be made to improve the quality of the experience, and the overall viability of the technology for teaching science.

The limitations most often cited by respondents dealt with their "inability to walk around the classroom to make things seem less formal" and the difficulty in "trying to see students' facial expressions on camera." The respondents stated that these problems caused the distance classes to be less personable. Respondents identified another limitation of the technology as being "the slowness of exchanging materials between sites." The most often cited limitation, which was a major concern of several respondents, was the lack of necessary scientific lab equipment and facilities in the distance education classrooms. Often, these classrooms were located at some distance from the science department.

> *You don't get as good instruction as you would if you had the class scheduled in the science building... where the instructor can quickly get out apparatus and show you live phenomena.*

The respondents in this study did, however, see potential benefits of the distance education technology for teaching science. They cited factors such as expanded course offerings, increased enrollments in courses, and reduced costs for hiring numerous instructors for only a few students at each site. A respondent commented that "the technology facilitates people taking courses from remote locations who might not otherwise be able to do so." Respondents saw potential benefit in the ability to use the technology to zoom in on small objects presented in class that normally would not be seen very clearly in a regular classroom and also the potential to use computer technology. In terms of personal factors, one respondent saw the opportunity to teach science via distance education technology as "a benefit for me in the future because any place I go for employment will look and say that 'This person has experience in something that is the wave of the future'."

A second classification of responses centered on suggested modifications that could be made in distance classrooms to better accommodate science teaching. Respondents felt that having a classroom with appropriate facilities for science was crucial so that demonstrations and hands-on activities could be more adequately performed. Some of these suggestions included "having portable lab benches and movable cameras," and "having the remote cameras zoom in on students faces when they key their microphone."

> *A lab table with a sink is what you would need. You have to be able to move around the room with a camera. The cameras now are stationary.*

The final classification of responses, and arguably the most important one, concerned the teachers' thoughts on the overall viability of distance education technology as a means of delivering science instruction. There was no clear pattern of agreement in this area based on the statements made by the respondents. While most respondents believed the technology was indeed a viable alternative to traditional teaching, many felt that this was only true under certain circumstances. For example, respondents felt that it was fine for introductory level science classes, but more advanced courses would "require a [significant] hands-on component that you won't be able to do," on the system.

> *The quality of instruction would be the same in a distance class as in a traditional class as long as you have a teacher who understands how to operate the system.*

The respondents voiced concern about possible negative impacts of the technology such as "reducing the number of teachers hired by schools," and "taping classes so that they could be used again in the future" without hiring an instructor. Another respondent was unsure of the actual cost-effectiveness of operating the technology, as opposed to just hiring instructors to teach the course in a traditional classroom.

The following is how a respondent summarized his feeling about the viability of distance education technology for teaching science.

> *Distance education isn't going to solve anything that has to do with hands-on teaching. If it's known where the line is drawn, where distance education is viable and where it's not, it will be a very useful system. You have to know that there are some classes that are not going to work. Once that's recognized, then it will work out fine.*

Discussion

The primary aim of this study was to amass information concerning the impact of distance education science teaching on science teachers who use it as a means of delivering instruction. Most teachers initially felt a considerable level of anxiety about teaching at a distance. This concern seemed to be the overriding issue for them at the time. Some respondents went to the extreme of memorizing entire class lectures so that all attention could be given to "button pushing." With time and experience, however, these fears diminished, resulting in more attention being focused on the lesson. It appears that this was the point at which the system's limitations were discovered. Because students were not in the same room as the instructor, it was difficult to get to know the students and monitor their level of course mastery. One way to get around this was to teach from remote sites or go to student laboratory sessions. This was not always feasible, given scheduling problems and the distances between sites. Another limitation of the system was the lack of mobility experienced by the teachers, as dictated by the fixed location of the controls. This led to a more formal class climate described as undesirable by our respondents.

Beyond the issues of formality and not knowing the students, a greater concern for science teachers was the ability to perform demonstrations and hands-on activities during a lesson. The distance education setting, as it currently exists, prohibits this. The classrooms lacked sinks, lab benches, and exhaust hoods. This presented problems for any science class which was not lecture/discussion oriented. These are problems which can be overcome. Suggestions offered included building a specialized distance science room or having portable lab benches and portable cameras. Since science classes require the most specialized equipment and arrangement, it only makes sense to have the origination site be in a science room. All other classes could easily be taught in a science room, but science teaching is not as easily adapted.

The final major concern voiced by all respondents was that of materials handling. This refers to the paper shuffle that takes place for any assignment, test, or quiz. This was cited as a source of frustration for all involved. Students and faculty both complained about the current delivery method. This could be overcome by using fax machines, electronic mail, or the Internet.

Conclusion

Many of the issues raised here can serve as useful hypotheses to be tested in future studies. How should distance education be implemented into preservice teacher programs? What are the most effective inservice experiences? Would the presence of laboratory facilities result in changes to teaching approach/style? How effective are alternate methods of handling materials between sites? Examining the attitudes and perceptions of the students of distance education science teachers might be of particular interest, especially when comparing students in the origination site to students at remote sites. This would provide a more comprehensive understanding of the dynamic interaction that exists between instructors and students who are separated by distance. Two-way, interactive telecourses provide opportunities for study that may not otherwise exist. Telecourses offer lifelong learning opportunities to the community at large and thus serve an important role in the education sector.

BEST COPY AVAILABLE

References

Carl, D. L. (1991). Electronic distance learning: Positives outweigh negatives. T.H.E. Journal, 18(May), 67-70.

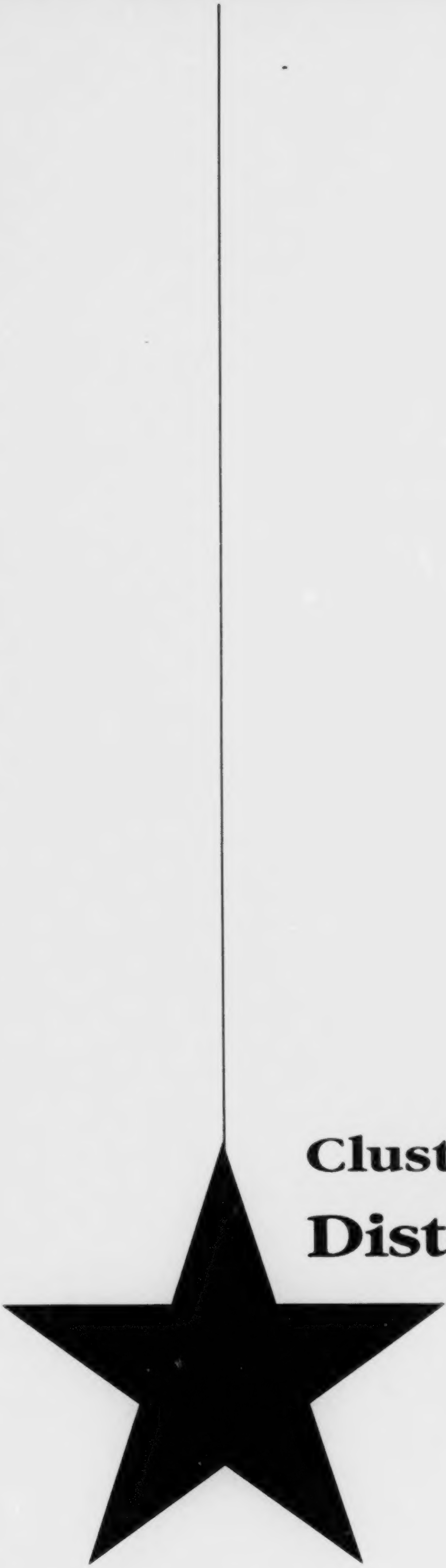
Chung, J. (1991). Televised teaching effectiveness: Two case studies. Educational Technology, 31(1), 41-47.

Glasser, B. & Strauss, A. L. (1967). The discovery of grounded theory: Strategies for qualitative research. Chicago: Aldine.

Jefferson, F. E. & Moore, O. K. (1990). Distance education: A review of progress and prospects. Educational Technology, 30(9), 7-12.

Mugridge, I. (1991). Distance education and the teaching of science. Impact of Science on Society, 164(41), 313-320.

Stern, C. M. (1987). Teaching the distance learner using new technology. Journal of Educational Technology Systems, 15(4), 407-418.



Cluster 4:

Distance Education in Postsecondary Institutions

Virtual Field Experience Utilizing Computer Networks and Interactive Television

Gayle Allen
Iowa State University

Introduction

> *By communicating with the eighth grade class, it brought in a realistic perspective that I could tie in with all my theory content methods classes. It helped bring everything together in a whole new context that was alive and real.*

The above quotation is from a response paper of a preservice teacher in the College of Education at Iowa State University who participated in a research study that used computer telecommunications and the interactive distance education facilities of the Iowa Communications Network (ICN) to link preservice teachers enrolled in a secondary reading methods course and eighth graders. This combination of technologies allowed the students to use written, voice, and visual communication to connect with each other.

It was hypothesized that this experience would increase the opportunities of preservice teachers to (1) interact with middle school students, (2) expand their knowledge of what students that age enjoy reading and writing about, and (3) develop confidence in their ability to respond to the writings of this age student. Another hypothesis was that the college students would use technology and feel more competent communicating using computer online technology.

Using Technology to Increase Student Contact

Beginning teachers often complain that they feel unprepared for the challenges they face in their first classrooms. According to Denton (1982), the preservice teacher may see early field experiences as beneficial training in preparing them to teach. Increasing the students' field experiences in preservice education curriculum should serve to increase the confidence level of new teachers. However, the early contact experiences that preservice teachers have with schools needs to be reflective and under the ausipces of their college instructor (Goodman, 1982). The use of online networks and distance education classrooms can create a virtual field experience and is a very feasible, cost effective way to increase preservice teacher contact time with students in an environment where the college instructor can monitor and guide.

The ability of preservice secondary teachers to interact with middle school students in a virtual field experience using online networks and interactive television suggests that this technology allows them to evaluate and learn what students at this age read and write about. The technology allows a one-to-one interactive arrangement and gives preservice teachers a chance to understand the student they are paired with and to follow their development and growth as readers and writers throughout the semester.

This virtual field experience is similar to a functional learning environment described by Newman (1987) and Riel (1991) which includes word processing, social interaction, and telecommunication networks that in combination create authentic literacy events that motivate students to use written language for communication. Text-based communication that is computer-mediated is interactive and requires active involvement of the participants (Harasim, 1990). This new language environment, using online and distance education, allows students to communicate with readers of different ages, backgrounds, and education (Riel, 1991; Hawkins & Sheingold, 1986).

Description of the Study

The participants in this study were 55 preservice education students enrolled in "Teaching Reading in the Secondary Schools" in the Fall, 1993 and Spring, 1994 semesters at Iowa State. The Fall semester had 27 students involved and the Spring had 28. The study measured the number of exchanges, as well as the length and the nature of the written exchange initiated by the college students.

During the first phase, the eighth grade teacher paired college students with her students. The online network communication was established between the middle school and the college class using America Online and Internet. The college students made the initial contact with their assigned computer pals by sending an informal message in which they described themselves and asked questions for the eighth grader to respond to. Also photographs were taken of each student to exchange with his/her assigned computer pal. Next, there was a "face to face" interactive meeting using the Iowa Communications Network (ICN) distance education classrooms.

The eighth graders and the college students had two meetings in the semester using the ICN classrooms. The first meeting occurred in the third week of the college semester and the final meeting in the last week of classes. The ICN meetings were one hour in duration with the first meeting used to introduce the students to each other and to find out about personal backgrounds, school involvement, and reading interests. The second and final ICN meeting was more focused, with the eighth graders asking the college students about college life. The college students formed five panels of four each and took ten minute turns at the "controls" to answer the eighth graders' questions.

There were a total of 152 messages sent by the 28 students during the spring semester; an average of 5.42 messages per student. The frequency of messages sent ranged from a low of 1 to a high of 13 over the 12 weeks of the spring semester. The most often occurring frequency was 8.

The voice of each message was classified as "friend," "teacher," "teacher/friend," or "critic." Twenty-two of the 28 students used a "teacher/friend" voice with the eighth grader. They seemed to be able to relate as an older adult and saw themselves in the role of "teacher," but could also respond to the eighth grader as an older friend. They combined the role of teacher and friend, asking and responding to questions on a personal level and moving back to the teacher role and asking questions and talking about the reading and writing and other classwork that their eighth grade partner was doing.

For a few of the preservice students, there seemed to be problems adapting to the teacher/friend role. Two students seemed to relate only as a friend or "sister" as they described the experience. One of these pairs began to write to each other outside the classroom and reports indicated that serious adolescent problems were discussed. At the other extreme were three preservice teachers who did not seem to be able to relate to this age student at all. They remained distant and the exchanges were very formal and stilted. One student's e-mail message to his eighth grade penpal was a critical analysis of a postmodern text that he was using in his college class. One student had only one exchange with her penpal and felt the technology was "too difficult" for her to learn.

The study also used a questionnaire to determine if there were changes in how the students perceived their knowledge and confidence level in sending e-mail messages and understanding the reading and writing interests of middle school students. Nineteen students completed both the surveys. The surveys included 14 items that students responded to on a Likert scale of 1 to 5, with 1 being "not knowledgeable" and 5 being "very knowledgeable." The difference in the means of four of the representative items is reported in Table 1.

Table 1. *Selected survey item response*

Item	Pre Survey		Post Survey		Change
	Mean	SD	Mean	SD	
Ability to send e-mail messages	2.21	1.54	4.21	0.83	+2.00
Ability to respond to writing	3.16	1.05	3.94	0.51	+0.78
Reading interest of eighth graders	2.89	0.91	3.89	0.78	+1.00
Writing ability of eighth graders	2.63	0.87	3.78	0.76	+1.15
Motivating reluctant readers	2.63	1.03	3.68	0.72	+1.05

Students' Reflections and Reactions

Twenty-seven of the 28 students wrote a final reflective paper explaining their reaction to and analysis of the experience. Of these reports, 23 students reported their reactions to the project as positive or very positive and four students defined the experience as negative. The following quotes are taken from these written reports and exemplify the general assessment of the project by the students:

> *Both the writing and the meetings over the ICN were helpful experiences to prepare me for future teaching. The writing let me get back into the mind of an eighth grader.*
>
> *The ICN meetings were a lot of fun. Being able to see and talk to the person you're writing to makes corresponding much more easy. The second meeting was unbelievable! The students opened up so much compared to the first time.*
>
> *Overall, I thought this was an excellent opportunity to learn about new technology and about junior high all at once. The correspondence was a lot of fun and very worthwhile.*
>
> *My experience with the computer pal was very helpful. It gave me a chance to see an eighth-grader progress throughout a semester.*
>
> *I was sure that I never wanted to teach junior high level kids. I had convinced myself that they would be too immature, and that they would drive me crazy. After taking part in this exchange, however, I have seen that they are really a good group of kids to work with. They seem motivated and excited to learn, and they are a lot more mature than I previously thought. I am now thinking twice about getting into this age level of teaching.*

Conclusion

This study attempted to create a virtual field experience for preservice teachers to interact with middle school students to observe their reading, writing, and communication skills. They were able to follow them through fourteen weeks of the school year. One of the most common comments in the written responses was "I had forgotten what it was like to be in the eighth grade." Some of the comments made were about the level of activity and excitement of this age student and indicate that the preservice students had a new awareness of and appreciation for this age student.

The results of the attitude survey indicate that there was a positive change in both the ability to use technology tools and in assessing the needs of eighth graders as readers and writers. These findings suggest preservice teachers can benefit from online experiences with students when there is focused activity, such as an emphasis on reading and writing skills, and when there is time for reflection and self-evaluation by the student.

The results of this research should contribute to the knowledge of how online communication and distance education can be used in the teaching of undergraduates in education. There are immediate implications for technology integration in the teacher education curriculum and for the collaboration of preservice teachers with students in middle schools. With the information gained from this study, there are indications that further studies could explore the possibilities of using technologies to widen the early field experiences of preservice education students. The preservice curriculum for teachers of reading in the secondary schools and middle school language arts curriculum could be modified to include early field experience contact while students are still under the auspices and direction of the university instructor.

References

Denton, J. (1982). Early field experience influence on performance in subsequent coursework. Journal of Teacher Education, 2, 19-23.

Goodman, J. (1986). Making early field experience meaningful: A critical approach. Journal of Education for Teaching, 12, 109-125.

Harasim, L. (1990). Online Education: An environment for collaboration and intellectual amplification. In L. M. Harasim (Ed.), Online education: Perspective on a new environment (pp. 39-67). NY: Praeger.

Hawkins, J., & Sheingold, K. (1986). The beginning of a story: Computers and the organization of learning in classrooms. In J. Albertson and L. Cunningham (Eds.), Microcomputers and education: 85th yearbook of the National Society for the Study of Education (pp. 40-57). Chicago: University of Chicago Press.

Newman, D. (1987). Functional environments for microcomputers in education. In Pea, R. & Sheingold, K. (Eds.), Mirrors of minds: Patterns of experience in educational computing (pp. 57-67). Norwood, NJ: Ablex.

Riel, M. (1991). Four models of educational telecommunications: Connections to the future. Education & Computing, 5, 259-274.

BEST COPY AVAILABLE

Distance Teaching with Interactive Television: Strategies that Promote Interaction with Remote-site Students

Molly Herman Baker
Western Illinois University

Introduction

The rapid growth of technology in America is causing large-scale changes in our society, especially in the types of employment available and the job skills they require. In an effort to better prepare learners for these societal and workplace changes, educational institutions and providers have adopted emerging technologies in an attempt to make the educational enterprise more efficient and effective.

One of the newer and quite promising educational technologies is interactive television, a learning environment that allows live two-way audio and video communication between teacher and students at multiple sites. Providers have heralded it as a technology that can help overcome the barriers of cost and equity of access for students (Hezel & Dirr, 1990), while offering an interactive environment similar to traditional education (Ehrmann, 1993). Many students and faculty proclaim its value because it eliminates the often-criticized shortcomings of educational television used in the 1950s and 1960s (Chu & Schramm, 1967), permitting easy and immediate exchange of verbal and non-verbal information.

The purpose of this study was to examine interactive television capability as it related to teacher effectiveness. The literature documents the importance of interaction for:

- types of learning (Hackman and Walker, 1990; Keller, 1994; Reder, 1982; Webb, 1983),
- learner satisfaction (particularly in postsecondary students) (Beare, 1989; Chu & Schramm, 1967; Ellis & Mathis, 1985; Jurasek, 1994; McKeachie, 1969; Ritchie & Newbby, 1989), and
- persistence of distance students (Garrison, 1990; Homberg, 1989; Sweet, 1986).

The literature also includes theoretical discussions on the importance of interaction in distance learning (Garrison & Shale, 1990; Holmberg, 1989; Moore, 1983) and research from the communications literature on interaction in traditional classrooms (Andersen, 1986; Norton, 1986; Richmond, Gorham & McCroskey, 1987). Recognizing that interaction contributes to student learning, satisfaction, and persistence and that interaction is a complex construct involving instructor, technology, and student variables, it seemed important to understand what instructional strategies/tactics/behaviors teachers can employ to maximize the interactive capability of interactive television technologies. For a variety of reasons, a naturalistic/qualitative methodology was chosen to explore this question.

Methodology

Setting

A midwestern community college district was the location for this study. Its main campus is in an agricultural area on the outskirts of a modest-sized city and students come from a seven-county region covering 4300 square miles with a population of more than 350,000. Outlying centers in seven small communities and a men's reformatory are linked to the main campus and each other by an interactive television network which transmits instruction to remote sites simultaneously. The reformatory is connected via voice transmission only (in keeping with state law); all other sites enjoy two-way audio and video.

The origination classroom contains long tables with tabletop microphones; a podium that allows maximum control by the instructor of what view appears on the screen; three cameras aimed at the instructor, the students, and the surface of the podium (functioning as a visual presenter); equipment installed into the podium for easy access by the instructor (VCR, audio tape player, laserdisc player); a wireless microphone for the instructor to wear; three monitors for students and the instructor to see what is being transmitted over the system; and a bank of course files where students pick up class handouts and returned assignments. The remote sites have one camera aimed at the students, similar tables and microphones, course files, and one or more monitors. These remote classrooms are housed in community college centers where college staff are available for registration, advising, and academic support.

Subjects

The primary subjects for this study were five faculty members who were highly-rated by students in previous distance education classes, who were known to make extensive use of interactive instructional strategies, and who had two to nine years of experience teaching on the system. Two were women; three were men. Three were full-time faculty and two were part-time. They represented several different dominant teaching styles and five different content areas (human relations, sociology, education, composition, and mass media) (see Appendix A for brief introductions to the five faculty; names have been changed to protect their privacy). Table 1 provides descriptive data about the five instructors.

Students in the five classes also participated in the study by completing Student Response Forms. Twenty-nine of the remote-site students also served as members of remote-site focus groups. A focus group is a homogeneous group of participants (from the same course, same site), who are interviewed in depth about a given topic (e.g. faculty/student interaction in their course). See Table 2 for a description of the student sample.

Data Collection and Review

A naturalistic study was designed to examine the interactive teaching strategies/tactics/behaviors used by the five faculty members. The investigator observed them, interviewed them, and studied videotapes of their classes during three periods of the semester (beginning, middle, end). The investigator surveyed their students (at the beginning, middle and end of the semester) and spoke with two focus groups of remote-site students from each class (see Appendix B for a more detailed description of the primary data collection activities of each phase).

At the completion of the data collection, the investigator completed detailed narratives of all of the videotapes and tested the validity of her observations against the narratives produced by an outside observer. All of the narratives, interview transcripts, and field notes were examined so that the data could be synthesized. Categories of instructional behaviors were identified from the results and used to color code all of the data sources.

Table 1. *Descriptive information about faculty*

	Mathew	John	Rita	LuAnne	Peter	Mean
Age	33	44	44	42	39	40.4
Discipline[a]	HR	TH	MM	SC	CPI	
ITV yrs.[b]	9	6	3	2	2	4.4
Dominant style[c]	L/D	L/D	L+L/D	L+L/D	L/D+D	
Class size[d]	34	47	39	35	28	36.6

[a] HR=human relations; TH=introduction to teaching; MM=mass media; SC=introduction to sociology; CPI=composition I

[b] Number of years the faculty member has taught on the microwave system.

[c] Dominant teaching style as described by students: L/D refers to lecture/discussion format; L to lecture primarily; D to discussion primarily.

[d] Enrollment figures based on 10/1/93 registration figures.

Table 2. *Decriptive information about remote site students by site*

	A	B	C	D	E	All
N students[a]	21	30	23	28	25	127
N SRS II[b]	16	25	14	23	19	97
M/F proportion[c]	50/50	44/56	50/50	30/70	21/79	39/61
Age[d]:						
18-20	50%	64%	36%	24%	32%	43%
21-24:	12%	24%	43%	24%	21%	24%
25+:	38%	12%	21%	52%	47%	33%
New to ITV	75%	72%	71%	61%	68%	69%
New to college	44%	12%	14%	39%	37%	29%

[a] Enrollment figures based on 10/1/93 registration figures.

[b] Number of Student Response Surveys filled out during Phase II.

[c] Percentage of males versus percentage of females for each remote site and overall.

[d] Percentage of students in each age group at each remote site and overall.

Results

The data analysis led to the labeling and grouping of most of the behaviors into seven broad categories. A cross-instructor comparison along the dimensions showed many commonalties and some distinct differences between the individual instructors. The seven dimensions were:

- nonverbal "immediacy" behaviors,
- verbal "immediacy" behaviors,
- behaviors that personalize the class,
- technology management strategies,
- methods for acquiring student feedback,
- methods used to manage student participation, and
- active learning strategies.

Although none of the dimensions, except technology management strategies, were unique to distance education, the manner in which they were manifested and their relative level of importance appeared to vary from traditional higher education. Nonverbal and verbal "immediacy" behaviors, efforts to personalize the class for each student, and active learning techniques appeared to collectively establish a climate that supported remote-site student participation.

Within this climate, the instructors encouraged verbal and nonverbal interactive behavior, solicited information on immediate student needs, employed questioning/responding patterns of participation management which fostered continued student involvement, and manipulated the technology in ways that promoted student participation.

For some of the dimensions (nonverbal immediacy, verbal immediacy, personalizing the class, and feedback methods), the instructors exhibited very similar behaviors. For the other dimensions (technology management, management of student participation, and active learning strategies), the faculty members were quite different from one another, reflecting their respective teaching styles.

Nonverbal Immediacy

Immediacy refers to the degree of perceived warmth or closeness between people (Mehrabian, 1972). Much of this perception is created nonverbally as people communicate with one another. Because television is not generally perceived to be a warm medium, the five instructors in this study all found that making an effort to nonverbally communicate approachability and warmth contributed to participation of the remote-site students.

BEST COPY AVAILABLE

For example, three of the five instructors kept the camera shot at close range so that the upper half of their bodies filled nearly 50 percent of the screen. This made it easy for students to see their facial expressions, gestures, and smiles and feel as if the instructor was establishing eye contact (Peter, Rita, LuAnne). The other two instructors set the camera view slightly farther back but not so much that the students couldn't easily see the same behaviors (Mathew, John).

Instructor facial expressions were positive and warm (i.e., frequent smiles; animated and expressive facial expressions; raised eyebrows; tilted head with an "I wonder," interested expression when students were speaking; pointing to chin or nodding slightly while intently listening and pondering an idea a student was sharing). Four of the five (Rita, LuAnne, Mathew, Peter) maintained frequent eye contact with the camera, often shifting their eyes back and forth between the students and the camera when they were talking, and usually looking at the camera when a remote-site student spoke. John tended to look at the students in front of him most of the time, but did look at the camera or switched the camera to the distance site when remote students participated.

All five appeared very relaxed, using gestures when speaking, and occasionally leaning back slightly in the chair. Peter used expressive gestures to illustrate points and often leaned toward the camera with "energy" when speaking. He seemed to be most aware of the power of the medium and how he could use facial expressions, gestures, and posture to convey his ideas or emotions to the students "out there." However, because he only had two students enrolled at the origination site, he may have been freer to focus his attention on the remote-site audience than some of the other instructors.

Verbal Immediacy

Verbal "immediacy" refers to how instructors use verbalizations to enhance their sense of approachability and warmth. For example, all five instructors used humor often to poke fun at themselves or to lighten the mood. They did this by providing humorous, often personal, examples to illustrate a concept. In addition to humor, all five faculty offered frequent positive encouragement when students contributed to the class discussion. John did this by expressing interest in the idea, posing questions that asked the student to elaborate, or using the idea himself to show how it related directly to what was being discussed. He tended to reward students for contributing rather than commenting directly on the quality of each response (e.g., "I'm glad you brought that up." or "I'm looking forward to hearing your ideas next time."). The others used a variety of strategies including elaboration of student ideas, expressions of intense interest in student ideas, attempts to clarify what the students were saying so that students got the impression the instructor was really trying to understand, and words of positive reinforcement whenever students spoke.

A third type of verbal immediacy behavior used by all five faculty was the frequent sharing of personal examples or ones highly relevant to the students. By combining these behaviors with nonverbal immediacy behaviors such as eye contact, relaxed posture and gestures, and vocal and facial expressiveness, students felt that their instructors wanted to hear their questions and ideas. By creating a context in which student participation was expected and desired, and by establishing a set of informal rules for that participation (see management of student participation section), students did not need to suspend their social needs while learning course content in a distance environment.

Personalizing the Class

Personalizing the class refers to strategies that instructors use to make the learning experience personal, relevant, and sensitive to the needs of individual students. All five instructors made an effort to learn all of the students' names and used them frequently in class. They also learned their voices, so that as the weeks went by, it became much less important for the students to say "This is Becky from ________ (remote-site)." Learning names/voices was accomplished in different ways: by taking roll (all five used this technique), using a site-by-site guide sheet the first few weeks of class (Mathew and Peter), teaching from the remote-sites occasionally (Rita, LuAnne, Peter), and soliciting short assignments or planning in-class activities to help get to know the students better.

In addition, all five solicited information by having students fill out a roster card during the first class. Most of them requested additional information on the back of the card about students' interests/goals/experiences that had to do with the focus of the course.

Other strategies used by the instructors to personalize the class included the use of get-acquainted activities during the first class or two (Mathew, John, Peter); originating from each of the sites at least once during the semester and allowing for individual student appointments before or after class regarding assignments and/or career counseling (LuAnne, Rita, Peter, John); and coming early to class/staying after class/remaining on-line during break to discuss individual questions about paper topics or project direction (Rita, Peter, John).

Finally, all five instructors made it clear that they wanted to be available to students for out-of-class contact. They listed how they could be reached on their syllabi and described the available options during the first class period. They reminded students of these options during subsequent classes, as exams approached, or due dates for student assignments drew closer. All five listed phone-in office hours on their syllabus or encouraged students to call them at home if they were part-time faculty without offices. They mentioned voice mail, the written mailgrams that are available at each site for mail-in questions, and phone availability at the main campus or remote site immediately after class.

Technology Management

The classroom on the main campus, where the classes originated, was designed to give the individual faculty member maximum control over the instructional environment. This means that the instructor could switch the video signal to any of the remote-sites at any time, or switch the camera view in the origination site from him/herself to the students or to the overhead camera when displaying instructional materials. Several of the faculty mentioned that it took a little practice at first to remember to attend to the technology in addition to the other teaching activities they were accustomed to monitoring. However, all five of them found ways to use the technology to support the kind of student participation they desired.

Collectively, all five used the first few classes to teach their students technology protocol. For example, by taking roll and testing the audio system at the beginning of each class, the students learned that someone at each site needed to press down the microphone button and say something. The instructors asked the students to say, "This is Michelle from ________," whenever they wished to speak. (This rule was relaxed within a few weeks because everyone appeared to have learned names and voices.) They also discussed what to do in case the technology was down for a particular class.

All five instructors tried to remind the origination site students to use their microphones when talking so that the other sites could hear. Finally, all of them put up a camera view of one of the sites or of an interesting visual whenever class was not in session, such as prior to class, break time, or during small-group break-out sessions.

The five instructors used the technology in different ways to support the kind of interaction they were trying to facilitate. These observations suggested that when discussing controversial subjects, leading fast-paced discussions with input from many students, or asking for one- or two-word responses, it was more effective to leave the camera view on the instructor to keep from shutting down the conversation or breaking the momentum. When attempting to expand participation, switching to a site to "call" on students could be effective.

Using the technology to monitor group break-out sessions and other in-class activities, or to solicit feedback and site-by-site reactions was also common practice. Switching to a particular site to talk with an individual student about a class topic or a question about a class assignment appeared to send a signal to the student that the instructor was willing to talk at more length about this matter. Finally, by switching frequently between the instructor, the sites, and the overhead camera view, the instructor forced students to focus their attention on different things (group directions, lecture visuals, people at a site, the instructor, etc.). This can be a very effective technique for holding and directing attention, not easy to duplicate in a traditional classroom.

However, when the camera view changed infrequently, student attention at the distance sites was difficult to maintain. Although this happened on occasion in all five classes, it was a consistent problem in one class where the camera view seldom changed. Students often conducted side conversations irrelevant to the class content during lectures. However, when the instructor returned the camera from the overhead view of her outline to herself for class discussion, the students were able to refocus their attention on the class and seemed to be somewhat aware of what the instructor had presented during the lecture. Much like "watching television" at home, they appeared to have been partially listening to the program while "doing" something else.

Feedback Methods

Faculty in traditional classrooms often claim that it is the nonverbal clues they acquire by scanning the student audience that tells them to take a break, tell a joke, or provide another example. They suspect that they cannot get that kind of information in a distance "classroom." Actually, the five instructors in this study all found methods to acquire this kind of information in alternative ways.

First, how does one find out if the students are understanding the content? Is their understanding sufficient to move on? In a traditional classroom setting, an instructor might watch for confused or frustrated facial expressions as clues and provide another example or rephrase an explanation of the concept. The instructional television (ITV) faculty sample acknowledged the value of reading nonverbal clues too. They said that they rely partially on the nonverbals of the origination site students. The instructors reason that if the origination-site students are confused or tired, probably the remote-site students are too.

However, the origination-site audience provides only part of the feedback needed. John and Peter attempted to collect additional information every ten to fifteen minutes in class by asking such questions as "Anyone have some vocabulary they'd like to ask about?"; "Any further questions about this?"; "What questions do you have before we move on?" In short, they all used a combination of nonverbal clues from the student audience in front of them and regularly posed questions (every ten to fifteen minutes for four of the five) directed to the class as a whole that gave the students an opportunity to say, "I'm lost" before getting too much farther on the class agenda.

What other types of feedback do the instructors seek? Often, they send out handouts to be discussed or student papers/projects that have been graded. All of the instructors made sure all the sites received the designated papers before launching into a discussion about them. Four of the five sought out information on the class process itself. For example, Rita and LuAnne often asked if anyone needed them to slow down or repeat anything, since they lectured without stopping for longer periods of time than the others. Others asked for written formative evaluations (John, Peter); for input on whether students wanted additional explanations for class assignments (LuAnne, Peter, John); or for a preference of format for exams, review sheets or class activities (John, Rita). Four of them used the technology, as well, to switch to each site during group activities to monitor progress and determine if the students understood the task they were to accomplish. Finally, four of them used the silent switching capability of the system to find out if students were all back from the break, present at the end of the class, or awake during a class discussion when the instructor had not heard from a site for a while.

Feedback on how the students were doing at any given time, then, can be acquired by noting the nonverbals of the origination-site students, by regularly asking if the students have questions or have received printed materials, by monitoring written assignments, by soliciting reactions to class process issues, and by using the technology to silently monitor "what is going on at the sites."

Management of Student Participation

Focus group interviews and direct observation of classes revealed the "shoulds and oughts" that were directly or indirectly communicated by each faculty member regarding participation in each class. Each achieved a unique pattern of interaction that relied on nonverbal and verbal immediacy behaviors, personalizing activities, feedback methods, and technology management techniques to establish a climate and a routine that contributed to and supported each faculty member's teaching style. This section describes a few of the commonalties across instructors.

In all cases, the instructors had emphasized during the first class their desire for the students to participate actively. They began by giving the students some practice using the microphones, for example, by asking simple questions: "Are you here, Erin?"; "Tell us your favorite music or something else off your ITV Roster Card that you would like to share with us." None of them insisted that the students who were sitting out of camera range move into view, except for a brief introduction during a get-acquainted activity. On the first student survey, several students mentioned that they were camera or microphone shy; two mentioned during the focus group meetings that they appreciated the opportunities for small group activities rather than having to speak on the microphone all the time. Four of the five instructors used small group activities often in their daily classes.

Active Learning Strategies

All five instructors talked about the need to use a variety of methods in a distance education class, changing the pace regularly and avoiding the "sit and watch" routine that is the norm in home television viewing. John felt that active learning was equally important for traditional students, but the others all felt that it was even more critical for distance students. Active learning strategies are discussed here because all of the instructors mentioned them during the faculty interviews as a tool they used to stimulate verbal interaction, a part of the bigger picture of "climate."

This section will touch on those active learning tactics that have not already been discussed in this report and that were employed by the faculty to contribute to the interactive climate of their classes. Some of the faculty (John, Rita, Peter) claimed that tactics that help keep the students' attention are not only important in a television setting but they are often easier to manipulate in a distance classroom than a traditional one. For example, making sure the visual image on the monitor changes at frequent intervals seems to attract attention to the screen. This is accomplished by showing different visuals such as graphs or descriptive tables (John, Mathew); switching to different sites (Rita, John, Mathew, Peter); showing video clips (Rita, LuAnne); showing student presentations (John, Peter, Rita); and focusing the camera on the instructor for short periods of time.

Assuming the students' attention is attracted to the changing monitor image, other tactics were used to direct the students' attention to important features of the screen. Rita, John, and Mathew frequently pointed a finger or a pen to points of interest on a visual display or wrote on the visual itself. All of them used the overhead camera to put up copies of handouts, exams, or other materials that had been sent to the sites to help students locate items before discussion.

Focusing attention is a very small part of keeping students "ready" to participate, however. The kind of active learning most of the faculty were referring to in their interviews involved participation in an activity other than watching the monitor. These instructional tactics promoted physical involvement as well as mental or verbal participation. For example, John, Rita, Peter, and Mathew frequently used small-group break-out sessions to discuss a question or solve a problem relevant to the day's topic. They also assigned student presentations on articles, projects, or papers.

Other structured activities that some faculty used to get everyone involved included dyad or triad quick discussions (John, Peter); structured sharing where everyone told the

BEST COPY AVAILABLE

class a prescribed bit of information such as a 1950's TV show (Rita, John, Mathew); microteaching lessons presented to the students at their own site (John); self-tests, review sheets, or surveys completed during class and then discussed (John, Mathew); journal entries such as reactions to a class experience or prescribed topics from the instructor (Mathew, Peter, Rita); and readings that were used as a stimulus for later discussion such as case studies or handout sections (John, Mathew, Peter, Rita, LuAnne).

Student Responses

Student responses to the particular strategies/tactics/behaviors used by each instructor were determined by administering three student response surveys (SRS) and conducting two focus group sessions with remote-site students from each class. Overall, 87% of the remote-site student respondents (n=95) expressed a preference for a teaching style that involved significant teacher/student or student/student interaction (SRS Two, Q7). However, 55% (n=74) did not feel comfortable participating in class unless the climate was supportive of student ideas (SRS Three, Q7). The percent of the respondents (n=94) who found it easier to participate in their ITV class than they had expected was 63% (SRS Two, Q14); many (69%) (n=95) found that they were at least as comfortable participating as they were in traditional classes (SRS Two, Q10).

Specifically, the results of the focus group interviews indicated that the remote-site students appreciated instructor eye contact with the camera, reminders to the origination-site students to use their microphones, supportive written feedback on assignments, occasional site visits by the instructor, effective use of the overhead camera, efforts by the instructor to determine if the students understood the day's content, frequent changes of pace or activities, and a friendly ambiance. They also liked opportunities to do site-based small-group activities, especially early in the term, so they could get to know their classmates better.

Other Variables

Although the major instructional influences in interactive television centered on the seven dimensions discussed above, three additional important variables merit mention. First, the basic teaching philosophy of the instructors seemed to motivate each of them to search for ways to encourage remote-site student participation. All of them genuinely believed that verbal participation was a valuable activity that contributed to learning class content.

Second, the camaraderie of each remote-site group appeared to contribute to whether the students were able to interact with and support each other during class and outside of class. The faculty, through the use of group break-out sessions and efforts to link sites with only one or two students, seemed to strengthen the students' ability to remain focused on the day's topic and enjoy the opportunity to participate in class discussion.

Finally, it appeared that the willingness of the faculty member to be contacted outside of class gave the students the impression that he or she valued contact with students and welcomed questions. Although many students did not feel a need to contact the instructor, several of them mentioned during the focus group interviews that the fact that the instructor welcomed this kind of contact made them feel more comfortable about speaking up in class.

These three variables are not faculty-controlled, in-class instructional behaviors, but are faculty-controlled, outside-of-class variables which appear to influence in-class interaction. They need to be explored more thoroughly in subsequent research.

Interactive Distance Teaching vs. Traditional Instruction

A secondary data analysis included comparisons of the descriptive data to the published literature on effective traditional instruction to determine if the results were unique to instructional television. Although none of the dimensions, except technology management strategies, were unique to distance education, the manner in which they were manifested and their relative level of importance appeared to vary from traditional higher education. For example, immediacy and personalizing behaviors as well as methods used to manage student participation are important aspects of establishing a supportive interactive climate in any class. However, in the interactive television context, the instructor must make a special effort to reach students who are not present in the room. It would be easy to employ an "out-of-site-out-of-mind" manner of relating to these remote site students. Eye contact, in particular, must be simulated, i.e., the instructor looks at the camera so that students feel like he or she is looking at them. Remote-site participation must be monitored and encouraged so that class discussion is not confined to only those at the origination site.

Similarly, instructors often seek feedback about student understanding of the content in all of their classes. Distance instructors, however, must use a different set of information sources to secure this feedback since they cannot rely on nonverbal clues in the audience as easily. Remote-site students are out of sight much of the time, and the camera view at the sites is often so distant that subtle nonverbal student behaviors are difficult to pick up when viewing the screen. For a more complete discussion of the unique aspects of these variables, as they relate to interactive television instruction, see Baker (1994).

References

Andersen, J. F. (1986). Instructor nonverbal communication: Listening to our silent messages. In J. M. Civikly (Ed.), Communicating in college classrooms. San Francisco, CA: Jossey-Bass.

Baker, M. H. (1994). Distance teaching with interactive television: Strategies that promote interaction with remote-site students. Unpublished doctoral dissertation, University of Iowa, Iowa City.

Beare, P. L. (1989). The comparative effectiveness of videotape, audiotape, and telelecture in delivering continuing teacher education. The American Journal of Distance Education, 3(2), 57-66.

Chu, G. C., & Schramm, W. (1967). Learning from television: What the research says. Washington DC: National Association of Educational Broadcasters.

Ehrmann, S. C. (1993). U.S. higher education in 1998: How it might use technologies for undergraduate education. Unpublished paper. Washington, DC: Annenburg/CPB Project.

Ellis, L., & Mathis, D. (1985). College student learning from televised versus conventional classroom lectures: A controlled experiment. Higher Education, 14, 165-173.

Garrison, D. R. (1990). Education and communication. In D. R. Garrison & D. Shale (Eds.), Education at a distance: From issues to practice (pp. 23-39). Malabar, FL: Krieger.

Garrison, D. R., & Shale, D. (1990). A new framework and perspective. In D. R. Garrison & D. Shale (Eds.), Education at a distance: From issues to practice (pp. 123-134). Malabar, FL: Krieger.

Hackman, M. A., & Walker, K. B. (1990). Instructional communication in the televised classroom: The effects of system design and teacher immediacy on student learning and satisfaction. Communication Education, 39(3), 196-206.

Hezel, R. T., & Dirr, P. J. (1990). Understanding distance education: Identifying barriers to college attendance (ERIC Document Reproduction Service No. ED340335)

Holmberg, B. (1989). Theory and practice of distance education. London: Routledge.

Jurasek, K. A. (1994, February). Distance education via compressed video: An evaluation of the attitudes and perceptions of students and instructors. Paper presented at the meeting of the Association of Educational Communications and Technology, Nashville, TN.

Keller, B. H. (1994, February). Instructional strategies for effective two-way video distance education: An exploratory study. Paper presented at a meeting of the Association of Educational Communications and Technology, Nashville, TN.

McKeachie, W. J. (1969). Teaching tips: A guidebook for the beginning college teacher. Lexington, MA: D.C. Heath.

Mehrabian, A. (1972). Nonverbal communication. Chicago, IL: Aldine-Asherton.

Moore, M. (1983). The individual adult learner. In M. Tight (Ed.), Adult Learning and Education. London: Croom Helm.

Norton, R. W. (1986). Communicator style in teaching: Giving good form to content. In J. Civikly (Ed.), Communicating in college classrooms. San Francisco, CA: Jossey-Bass.

Reder, L. M. (1982). Elaborations: When do they help and when do they hurt? Text, 2, 211-224.

Richmond, V., Gorham, J., & McCroskey, J. (1987). The relationship between selected immediacy behaviors and cognitive learning. In D. McLaughlin (Ed.), Communication Yearbook 10 (pp. 574-590). Beverly Hills, CA: Sage.

Ritchie, H., & Newby, T. J. (1989). Classroom lecture/discussion vs. live televised instruction: A comparison of effects on student performance, attitude, and interaction. The American Journal of Distance Education, 3, 36-45.

Sweet, R. (1986). Student dropout in distance education: An application of Tinto's model. Distance Education, 7(2), 201-213.

Webb, N. M. (1983). Predicting learning from student interaction: Defining the interaction variables. Educational Psychologist, 18(1), 33-41.

Appendix A. *Faculty Descriptions (names changed)*

Mathew

Mathew is a 33-year-old full-time faculty member in the marketing department. He teaches traditional classes on the main campus, and has taught Human Relations for nine years on the interactive television system. He has extensive retail experience and has sold real estate. There were 25 students enrolled in his class (approximately 50% male and 50% female), with 64 percent of them at remote sites. Human Relations met three times per week in one hour and ten minute sessions.

John

John is a 44-year-old full-time faculty member. He has taught at the community college for 17 years, six of them with classes on the interactive television system as part of his teaching load. He is a member of the education department and teaches educational psychology and other courses for students seeking teacher certification. He taught Introduction to Teaching on the interactive television system this term. There were 40 students enrolled in the class (nearly twice as many females as males), 63 percent of them at remote sites. Introduction to Teaching met twice a week: Tuesday for one hour and ten minutes and Thursday for two hours and ten minutes.

Rita

Rita is a 44-year-old full-time faculty member and chair of the Journalism and Public Relations department and has 18 years of teaching experience. She teaches traditional classes on campus and has taught Mass Media for four semesters on the interactive television system. She has worked as a city editor and reporter and still does some "moonlighting" "to keep herself in touch with the field." There were 26 students enrolled in the class (evenly distributed between males and females), and 54 percent of them were at remote sites. Mass Media met once a week for two hours and 45 minutes.

LuAnne

LuAnne is a 42-year-old part-time faculty member. She has taught traditional classes in anthropology on campus for three years and Introduction to Sociology on the interactive television system for two years. She has taught at the high school level and is presently working on a Ph.D. in Anthropology with research on drug and alcohol abuse among Maltese immigrants. There were 29 students enrolled in her class (more than twice as many females as males), 79 percent of them at remote sites. Introduction to Sociology met twice a week for one and one-half hours each time.

Peter

Peter is a 39-year-old part-time faculty member. He has taught traditional classes in composition on campus for three years and has taught Composition I on the interactive television system for two years. His academic and professional background has involved acting and film, as well as teaching study skills, reading, and composition at three four-year colleges in addition to the community college. There were 21 students enrolled in his class (1:3 males to females), 91 percent of them at remote sites. Composition I met three times a week for one hour and ten minutes each time.

Appendix B. *Data Collection*

Phase I

Phase I of this study was primarily designed to (a) collect descriptive information about the setting so that readers would have an accurate view of the physical environment of the interactive television classroom; (b) begin to establish a relationship with the five faculty by getting to know their backgrounds and philosophies of teaching; (c) identify and explore factors that faculty think about when planning a course they anticipate teaching on interactive television; (d) record student orientation activities and other faculty behaviors during the first two days of class that might contribute to student attitudes and interactive behavior; and (e) solicit first impressions of the social climate as the students perceive it after one day of class.

Phase II

Phase II was designed to (a) collect descriptive information about some of the remote-site settings so that readers and the outside observer would have an accurate view of the physical environment of these classrooms; (b) record instructional techniques and faculty behaviors that occurred during class-time interaction (from the remote-site); (c) record student behaviors at the remote sites during class (when the microphone was on and off); and (d) solicit student attitudes and observations about the interactive climate in the class.

Phase III

Phase III focused on faculty, student, investigator, and observer perspectives of specific instructional techniques used by the faculty to promote interaction. The faculty interviews, student surveys, and focus group discussions were designed to test ideas emerging from the data analysis of Phase II, as well as to identify any new information that might emerge later in the semester.

BEST COPY AVAILABLE

Using Diaries to Assess the Learning Needs and Course Performance of Students Served by Three Instructional Delivery Means

David L. Doerfert
W. Wade Miller
Iowa State University

Introduction

Distance education offers tremendous opportunities, as well as challenges, to today's educators. The demand for flexible, relevant educational programs is high. The technological alternatives and capabilities for linking teachers and learners are increasing. At the same time, tight financial conditions confront many higher education institutions. In response to these opportunities and challenges, distance education is advancing, taking on added importance for many institutions, and influencing traditional education in a "convergence" of educational practices (Smith & Kelly, 1987).

Educators often rely on an intuitive sense of potential instructional effectiveness and fail to ask basic questions of students to confirm or reject these intuitive assumptions. Subsequent efforts to reinforce intuition with hard data often fall short. While intuition can provide a glimpse of the potential benefits of distance education, focused research will determine if the current interest in distance education is justified (Willis, 1993). The effectiveness of educational endeavors is typically measured by learning. However, in the case of distance education, effectiveness encompasses a broader concept. In addition to learning, it may include access to education resources.

If quality distance education programming is to be developed and delivered, research is needed to understand the special needs of the off-campus learner. Understanding these needs will affect the development and delivery of future distance education programming, aid in more clearly targeting inservice activities, and enhance the distance learning process for all students.

Purpose and Objectives

The purpose of this research was to describe student attitudes, perceptions, and course performance in an Iowa State University College of Agriculture course taught using three delivery systems: (1) face-to-face instruction; (2) Iowa Communications Network (ICN), a two-way fully interactive audio and video system; or (3) videotape. Specific objectives of this study were to:

1. Identify and describe the special needs (concepts) of distance learners who self-selected the type of instructional delivery system.
2. Compare student performance with the type of instructional delivery system chosen.
3. Compare student performance with identified concepts and demographic measures.

Procedures

Recent years have witnessed an increased interest in applying qualitative research methods to the study of social and cultural processes. The turn to qualitative approaches has been especially prominent in mass communication research (Jensen, 1991). A key feature of any qualitative method is that responses are not pre-coded from the researchers' perspective and analyses are not derived from pre-specified hypotheses. The analysis is inductive and seeks to uncover 'significant phenomena' or 'essence' in a respondent's experience (Parer, 1988).

Diary studies have been found to be immensely useful for pedagogical purposes, for course evaluation, and for basic research (Howell-Richardson & Parkinson, 1992). In the teaching of language, the use of diaries as a research or evaluation instrument is widespread. The available literature on the use of diaries is very positive, but as Howell-Richardson and Parkinson (1992) state: "this may be a distortion due to the well-known fact that only 'successful experiments' tend to reach publication and that their 'successful' aspects tend to be emphasized" (p. 74). Howell-Richardson and Parkinson suggest that many diary projects are aborted or found to be unsatisfactory in various ways. However, the researchers believed that diaries were a potential data collection instrument that would allow a study's objectives to be achieved.

Students enrolled in an Iowa State University College of Agriculture course (Animal Science 511—*Applied Ruminant Nutrition)* that was delivered by more than one instructional delivery system (i.e., face-to-face instruction, videotape, and ICN) during Spring, 1994, were asked to participate in this study. The course was team-taught by two Animal Science faculty members who received prior instruction on using the technology and revising their visuals for broadcast presentation (i.e. larger font sizes, use of color, pacing of content).

The ICN is an end-to-end fiber optic digital transmission technology that provides for full color, full motion, interactive video transmission, error-free data transport, and sharp, crisp voice communications. The network links Iowa's K-12 schools, public universities, community colleges, independent colleges, government offices, and libraries. These facilities are available to Iowans through access points in each of the state's 99 counties, thus making everyone within 20 minutes of an ICN site.

During the first class session, the purpose of the study was explained and students were asked to complete three "mini" diaries for seven to ten day periods at the start, mid-term and end of the course. Participation was voluntary; students were assured that the course instructors would not see the individual diaries and that participation would not affect their course grade. Demographic data were collected from the non-participants and compared to demographic data collected from the participants in an attempt to increase the generalizability of the data to the entire course population.

Analysis of Data

Selected faculty and staff in the Department of Agricultural Education and Studies analyzed the diaries for common variables and the frequency with which they occurred. This analysis included a four-step process:

- reading each diary to gain familiarity with the content;
- simplifying what each student recorded, or getting at the "essence;" shortening the diary, but without losing the meaning;
- comparing and contrasting what each student recorded and identifying variations and common themes in the diaries;
- describing the variations among students, relating the experiences to other concepts and theories of how students learn (Morgan, 1991; Parer, 1988), and using quotations from the diaries to illustrate and highlight students' experiences.

With the qualitative analysis of the diaries completed, five concepts were identified that were either intrinsic or extrinsic to the learner. In comparing these concepts to previous diary studies by Parer (1988) and a summary of research into student learning in distance education by Morgan (1991), consistency was found between the concepts identified in this study and previously published works. The researchers chose to use the terminology provided in these previous works to complete the data analysis and to discuss the findings. The frequency with which concepts occurred in each individual's diary was recorded. Additional data analysis included the relationship of these concepts to student course performance, type of delivery system selected, and other selected demographic measures.

Concepts

To aid in the reader's understanding of the results, a brief summary of the concepts, as described in the Morgan paper (1991), is provided.

Concept 1

Course design and assessment is one of the key areas where distance educators and educational technologists can influence how students go about their studies. Parer (1988) described four sub-areas within this concept:

- Difficulty in studying
    - a) "Getting going" for new students.
    - b) Lack of understanding of assignment requirements.

- Relationship of assignments to studying
    - a) Assignment conscious (assignment influences what is studied).
    - b) Assignment blind.

- Dialogue and feedback
    - a) Isolation (often emotional and confidence issues).
    - b) Turnaround time.
    - c) Need for interaction (meet and discuss assignment with other students or instructor).

- Unaware of course demands (prior to enrollment).

Concept 2

Orientation to learning is the collection of attitudes, aims and purposes that express a student's relationship with a course and the particular educational institution. Unlike motivation, which would describe students as more or less motivated, orientation is concerned with the qualitatively different ways students relate to their courses. The main variations in orientation are set out in Table 1. These orientations have been identified with both on-campus students and those studying at a distance (Gibbs, Morgan, & Taylor, 1984).

An important feature of orientation is that it is not fixed. Students will change and develop over time. The notion of changing orientations is particularly important with adult students, who often comprise the largest population of students studying at a distance. For adult students, often studying part-time, the interactions of career "lines" (in the workplace or domestic setting) with career "lines" as a student contribute to the changing contexts of orientations.

Concept 3

Students' development as learners relates to how students change and develop as learners as a result of their experiences in education. Säljo (1979) and Marton and Säljo (1984) have developed a scheme for studying people's learning with five distinct levels. Levels 1, 2 and 3 are concerned with learning as an accumulation of information, the memorization of facts, and the learning of set procedures to be used in practice. In contrast, levels 4 and 5 describe learning as the "abstraction of meaning" and as an "interpretive process aimed at understanding some aspect of reality." In the case of levels 1, 2 and 3, learning is viewed as a relatively passive activity with emphasis on reproducing knowledge, whereas for levels 4 and 5, knowledge is actively constructed by the learner.

Concept 4

Approaches to studying relates to what students do when confronted with a particular learning task. Marton and Säljo (1976) described how students tackled the reading of academic articles. They identified the major distinction between a "deep approach" and a "surface approach." The key variations in approaches to study are summarized below. The significance of these approaches is that they are linked to different learning outcomes. If students concentrated on memorizing the facts and the details, seeing the tasks as externally imposed (a surface approach), they would end up with a poor understanding but with knowledge of detail. In contrast, if they intended to understand the material and interacted with the content of the text (a deep approach), they stood a better chance of getting the author's "message."

- Deep Approach — Intention is to understand
    a) Focus on what is 'signified' (e.g., the author's arguments).
    b) Relate and distinguish new ideas and previous knowledge.
    c) Relate concepts to everyday experience.
    d) Relate and distinguish evidence and argument.
    e) Organize and structure content.
    f) Internal emphasis: "A window through which aspects of reality become visible, and more intelligible."

- Surface Approach — Intention is to complete task requirements
    a) Focus on the 'signs' (e.g., the text itself).
    b) Memorize information and procedures for assessment.
    c) Unreflectively associate concepts and facts.
    d) Fail to distinguish principles from evidence, new information from old.
    e) Treat task as an external imposition.
    f) External emphasis: Demands of assessments, knowledge cut-off from every day reality.

Table 1. *Students' educational orientations (Morgan, 1991)*

Orientation	Interest	Aim	Concern
Vocational	Intrinsic	Training	Relevance of course to future career
	Extrinsic	Qualification	Recognition of value of qualification
Academic	Intrinsic	Follow intellectual interest	Choose stimulating courses
	Extrinsic	Educational progression	Grades
Personal	Intrinsic	Broadening, self development	Challenge, personal interest
	Extrinsic	Compensation, proof of capability	Pass the course
Social	Extrinsic	Have a good time	Social facilities and sport

Concept 5

Learning outcomes relates to what the students actually learned from a course of study. Research in learning outcomes has focused on learning from the teacher's perspective (scoring pass-level marks on tests, assignments, and examinations) and more importantly, from the student's perspective (how personal understanding of key concepts and ideas have changed as a consequence of studying a course).

Results

Objective 1

Objective 1 was to identify and describe the special needs of distance education learners who self-selected the type of instructional delivery system within a College of Agriculture course.

Demographic measures

Fifty-eight students completed the course out of an original enrollment of 60 (two students dropped the course with no reason indicated). Of this enrollment, 32 students completed the course by videotape, 16 completed the course via the ICN system at one of three ICN receiving sites (10 at Rock Rapids, 4 at LeMars, and 2 at Manchester), and 10 students received face-to-face instruction at the origination classroom.

Eleven students (19%) (six videotape, one on-campus, and four ICN students), completed one or more of the three mini-diaries provided. Thirty-nine additional students provided demographic data, with additional data collected on all students from course registration forms and Professional Agriculture Program files.

Student demographic data is displayed in Table 2. Students' age ranged from 27 to 43 years for ICN students, and 27 to 48 for videotape students (the on-campus students did not report their age). Off-campus students were typically married (on-campus students did not indicate their marital status). The majority of the students in all groups were male.

ICN students were either engaged in farming or employed in another agribusiness and were taking courses part-time to improve their business or career performance. Videotape students were more often engaged in an agriculture business other than farming, considered themselves part-time students, and were divided on their reasons for enrolling in the course between wanting to improve their business or career performance and personally pursuing a degree. On-campus students were typically full-time students in the College of Veterinary Medicine and were enrolled in the course as a means to complete their studies.

Diary concepts

As discussed earlier, the researchers adopted the concept terminology and definitions summarized in Morgan (1991) as a result of the identified similarities between this study's findings and the Morgan paper. Each of the five concepts are listed with excerpts from selected diaries to clarify the findings of this study.

Course design and assessment. One of the sub-areas of this concept is "Difficulty in Studying." Two students commented on the difficulty of "getting going" with their studies:

> *I just finished watching the next to last video—it's hard to get motivated to watch them but they always seem to go by fast.* —videotape student
>
> *My expectations are more of myself than of the course. First and foremost is to keep up. Since I take this course from tapes it is easy to say 'I'll work on this another day when I'm not so busy.*—videotape student

Another sub-area of this concept is "Relationship of Assignments to Studying." One student provided this insight:

> *After the first two sessions I have been somewhat disillusioned with all the new technology and anatomy of cow, but after working work problems I have been guided back on track.*—ICN student

An on-campus student expressed the need for clarification of assignment expectations. Further, the student questioned whether the three delivery modes meant different expectations:

> *An understanding about exams and how information is to be integrated for study. . . . . What are the expectations? [We] are not really sure of level of learning expected. Is this to be more practical or research/academic? What are expectations of off-site students?*—face-to-face student

The sub-area most commonly identified in the diaries (in 8 of the 10 diaries) was "Dialogue and Feedback" with several comments related to turnaround time and the need for interaction. Comments included:

> *The instructors seemed very willing to communicate, both during classtime and during other hours.* —ICN student
>
> *It would be nice if we could have a bull session—sort of brainstorming right after the class is over. . . Why can't it be set up so at 9:00 the lecture stops and then there is time for B.S. Those who don't want to stick around can just take off.*— ICN student

BEST COPY AVAILABLE

Table 2. *Description of students enrolled in Animal Science 511 during spring semester 1994*

Measure	Face to Face (N=10)	ICN (N=16)	Videotape (N=32)	Total (N=58)
Age				
Mean	N/A	36	37	37
Range	N/A	27-43	27-48	27-48
Gender				
Male	8	16	29	53
Female	2	0	3	5
Marital Status				
Married	N/A	4	9	13
Single	N/A	1	0	1
Occupation				
Farming	0	3	2	5
Agribusiness	0	2	5	7
Extension	0	0	1	1
Ag. Teacher	0	0	1	1
Other (Student)	10	0	0	10
Enrollment Status				
Full-time	8	0	0	8
Part-time	2	11	28	41
Declared Major				
Professional Agriculture	1	3	11	15
Veterinary Medicine	9	0	0	9
Agronomy	0	0	2	2
Agricultural Studies	0	7	5	12
Undecided	0	6	13	19
Other (Business Administration)	0	0	1	1
Reason for Enrolling in Course				
Pursuing a degree	8	1	3	12
Improve business/career	0	3	6	9
Other (combination)	0	1	0	1
Final Grade[a]				
A	8	2	12	22
B	1	7	11	19
C	0	0	1	1
Incomplete	1	0	3	4
Audited (no grade given)	0	7	5	12

[a] Final grades as of June 1, 1994

> *[I] kind of wished I was taking the class via ICN during the question/comment period. [I] will just have to call later.*—videotape student

Two comments were provided in the sub-area of "Unaware of Course Demands" (prior to enrollment), both by videotape students.

> *I think there will be more reading and studying than I expected.*—videotape student

The researchers received several comments related to how the instructors used the electronic technology and how the technology operated, perhaps due to the newness of the technology to both the teachers and the students. The researchers created a new sub-area entitled "Delivery and Instructional Technology" within the *Course Design and Assessment* concept.

> *The extent to which telecommunications is able to reach many people at once. Amazing!*—face-to-face student

> *Just had 3rd class session last night. [The instructor] had more technical problems with the equipment which was a little annoying at times. Maybe it would help if there was a technician sitting next to him to switch cameras back and forth, focusing, etc. That way the instructor can keep his mind on teaching.*—ICN student

> *Enjoy watching them fumble with the new technology from time to time!*—ICN student

> *Finished tape over lunch. The by-products section seemed to get hurried to be over by the time they went off the air.*—videotape student

> *I really like the video format—you can fit it into your schedule when you have the time—this also can prove to be a problem though!*—videotape student

Orientation to learning. Similar to the results of previous studies of distance education students, the two groups of off-campus students in this study frequently displayed a vocational orientation to learning and an intrinsic interest in the course.

> *While studying at ISU, I took only one nutrition class. Now my career as a Livestock Production Specialist requires that I have extensive knowledge of nutrition.*—videotape student

> *I hope what is gained is applicable to our farming operation. Time will tell.*—ICN student

Fewer comments indicating academic orientations were found within the diaries, but the comments were found in the writings of the off-campus students, as well as of the on-campus students.

> *I took this class because it relates directly to my job, but also to see if I'd like the format—if I did, I was planning on taking more to get a master's. Well, I think I will take more classes.*—videotape student

> *The lectures to date have certainly stimulated the 'gray matter'.*—ICN student

> *This course fits well into scheduling into veterinary medical school.*—face-to-face student

Few personal orientation and even fewer social orientation comments were offered, but those that were offered displayed the life of a part-time student and reflected how little on-campus students may know of being a part-time student.

> *My business here is being extended—I hope I get back in time to study better for the quiz.* (5 days later) *I'm trying to study in the car as we travel back home, but I'm getting car sick! I'm not sure I really have the time for this class—there are so many other things going on.*—ICN student

> *Although I'm sure that [the instructor] knows his material thoroughly, his delivery is very dry. It must be challenging for those in remote sites and viewing via videos. I have often wondered about the relevance of much of the presented material for "off-site" participants. Many of them, I assume, have a lot of practical experience.* —face-to-face student

Students' development as learners. A great deal of difference appeared in the diaries related to students' development as learners. Comments from several students indicated that the content challenged them to develop to level 3 (learning of set procedures to be used in practice) or higher (learning as '4' the 'abstraction of meaning' or as a '5' 'interpretive process aimed at understanding some aspect of reality'). However, the face-to-face students and others who were auditing the class provided conflicting views, perhaps reflecting the diverse backgrounds and experiences brought to the class.

> *We had class last night. The material was a little over my head—good thing I'm just auditing this class! . . . I like Math and trying to figure things out—It's the memory work I have problems with.*—ICN student

> *Basically the material covered was background information. Some of the content was new to me, but so far not much that was applicable out on the farm (or should I say in the feedlot).*—ICN student

> *Went to presentation today at Vet School on problems in feedlot cattle and learned some very good applied information that I thought would have been covered in class."* —face-to-face student

Approaches to studying. Of the diaries that indicated how students were confronting the content of the course, nearly all indicated a deep approach to the materials as they sought to understand and apply the reading material. The comments included how the students are taking advantage of the technology as they seek a deeper understanding.

> *The advantage of the video . . .and go back over it if you missed something or didn't understand it the first time.* —videotape student

> *To date, [one instructor's] lectures have been more complex and harder to follow as his handouts are not as inclusive as [the other instructor's]—thus more note taking tends to interrupt my concentration on the lecture.*—ICN student

Learning outcomes. Only one student provided comments that related to what the student actually learned from this course of study. One comment reflects that the teachers' outcomes may have been met but not necessarily the student's.

> *I just watched the last video! It's over now except for the final. I knew the final would be something like this. It seems like some people will have an advantage on this—but I have to look at it this way—it will definitely be a learning experience! This will be the first time I have ever formulated a ration, but this is what I expected to get from the class. I kind of expected more applied information from class though like an example of ration formulation like they're asking us to do in the final. I don't have any idea where to even start.* —videotape student

Objective 2

Objective 2 was to compare the students' performance with the type of instructional delivery system chosen. Students receiving face-to-face instruction had higher final grades than students receiving instruction via either of the off-campus delivery systems. Eighty percent of the face-to-face students achieved an "A" or "A-" grade, while only 46% of the videotape students and 22% of the ICN students were able to achieve this level of academic performance. The students' course performance was compared to the instructional delivery system. There was no significant difference between chosen instructional delivery system and final course grade. These results are displayed in Table 3.

Objective 3

Objective 3 was to compare the students' performance with identified concepts and demographic measures. No significant difference was found between students' course performance and the identified diary concepts. It is likely that the low number of diary participants affected the statistical power of the test. For two demographic measures, where a larger "n" was present, important relationships with course performance were found.

All full-time students received an "A" as their final grade, while 14 (39%) of the part-time students (excluding students auditing the course) received an "A" as their final grade. Students' course performance significantly differed by enrollment status (Table 4).

More students who enrolled in the course as a means to complete a degree received an "A" (10 out of 11 students or 91%) than did students who enrolled in the course as a means to improve their business or career (5 out of 10 students or 50%). Students' course performance did not significantly differ by reason for taking the course (Table 4).

Table 3. *Relationship of students' course performance to instructional delivery system chosen*

Delivery System [a]	A	B	C	Incomplete	Total
Face-to-face	8	1	0	1	10
ICN	2	7	0	0	9
Videotape	13	11	1	3	28

[a] Cramer's V=.33191, p = .11045

Table 4. *Relationship of students' course performance to selected demographic measures*

Demographic Measures	A	B	Incomplete	Total
Enrollment Status[a]				
Full-time	8	0	0	8
Part-time	14	18	4	36
Reason for Enrolling [b]				
Pursuing a degree	10	1	0	11
Improve business/career	5	4	1	10

[a] Cramer's V=.47140, p=.00753

[b] Cramer's V=.45925, p=.10920

Conclusions and Recommendations

Obviously, with a small sample of students, any conclusion must be made cautiously. However, conclusions may be generalizable, as the findings were similar to those of a previous study. Also, these experiential summaries can provide increased awareness as others address similar situations.

The results of this study did not provide particularly powerful insights into how future course offerings should be structured for multiple media delivery or if simultaneous delivery by multiple media forms should be continued. Conclusions made from the analysis of the demographic and course data and the qualitative analysis of the diaries are as follows:

1. Student diaries revealed several concepts, both intrinsic and extrinsic to the student, about course design and assessment, the students' orientation to learning, how students developed as learners, how students approach studying for the course, and how learning outcomes differed between teacher and student.
2. Off-campus students (those who received the course content via ICN or videotape) were typically employed and enrolled part-time, whereas most on-campus students were enrolled full-time.
3. Off-campus students more often expressed difficulty in managing studies with work, family, and social obligations than did on-campus students.
4. Off-campus students were unable to achieve the same level of performance as on-campus students (those who received the course content by face-to-face delivery).
5. There was no relationship between concepts found in the diaries and course performance, though this may be due to low statistical power.
6. Diaries are fruitful sources of information; however, they may not be the best method of qualitative data collection with this group of students as busy schedules often made diary writing a low priority.

The following recommendations can be made based on these conclusions.

1. Additional research is needed on distance course delivery conducted simultaneously with traditional on-campus face-to-face delivery.
2. Texts of these diaries should be shared with future distance instructors as they prepare for content delivery. An increased awareness may be gained, thus improving distance course design and delivery. Assistance should be offered to the distance instructor to prevent any possible bias towards on-campus students.
3. Assistance should be provided to help off-campus students better manage their studies. This could include student handbooks with studying techniques and suggestions, creation of regional study centers and discussion groups, and alternative forms of assigned reading material (such as audio books).
4. Other, less obtrusive, methods of qualitative data collection or multiple methods of data collection should be considered.

Discussion

The diaries used in this study generated responses from a small sample of students, partially due to the personal, academic, and vocational time commitments of students, and also through the lack of specificity on how to respond in a diary. However, this study provides food for thought for future distance educators.

The use of multiple delivery technologies was of interest and concern to the students in this study, thus warranting a new sub-area being added to the concept of course design and assessment defined in Morgan's review of research on student learning in distance education (1991). Distance educators and educational technologists must be aware that poor handling of the technology is a noticeable distraction to the students and may affect their learning. As universities struggle with increased roles in distance education, a priority for research in distance education should be to improve our understanding of students' experiences of course design and assessment and impacts on student learning and technology transfer.

Morgan (1991) proposed that in terms of research, the concept of orientation can be used to develop typologies to describe in more detail what students hope to gain from the course. In terms of instructional design, a deep understanding of the variations in orientation to learning between on- and off-campus students can enhance a university's ability to disseminate information and to transfer technologies to learners. Morgan added the following as a reminder of students' subjective perceptions of their studies:

> Often teachers and distance educators seem to be unaware of the very different orientations held by students. It is often assumed that students are engaged in study for the single reason of studying the subject and gaining the highest grades in assessment. . . .However, the studies on orientation provide a strong reminder of the complex mixture of reasons that students—especially adult students—have for continuing their education (p. 4).

Morgan, in his summary of student learning in distance education stated: "The importance of students' development as learners or their conception of learning is that it appears to have a limiting influence on what students will do when tackling a particular learning activity" (p.7). The diary entries of this study did not support or dispute this statement but did indicate that this graduate-level course was designed and delivered at a level above the mere accumulation of information or memorizing facts—perhaps more reflective of the teachers' desired outcomes.

The importance of the approach to study is that it is linked both empirically and logically. Helping students to engage in a deep approach is therefore a crucial issue for all teaching and learning (Morgan, 1991). In this study, especially in the off-campus students, a deep approach to studying was evident. Is there a link between vocational orientation (dominant in off-campus students of this study) and their approach to studying? This could be a crucial research question for distance education, especially for instructional design decisions.

While the instructor determines successful mastery of content through passing-level marks on tests, assignments, and examination, off-campus students may determine mastery by their ability to use the course content within their business, career, or personal life. Distance educators and educational technologists should give strong consideration to the desired learning outcomes of the distance student and consider assessment alternatives that will allow the learner to achieve success on their terms.

The use of diaries in this study was not viewed as a success in terms of participation—even though the information gained from the limited participation further supported previous research findings. However, off-campus students typically balance their time between a full-time career or business, a family, and their need for continuing education. Writing in a diary is likely viewed by students as a time robber versus a means to reflect on their studies. Diaries themselves do not encourage students to be reflective about their studies. That motivation must come from another source.

References

Gibbs, G., Morgan, A.R., & Taylor, E. (1984). The world of the learner. In F. Marton, D. Hounsell & N. Entwistle (Eds.), The experience of learning. Edinburgh: Scottish Academic Press.

Howell-Richardson, C., & Parkinson, B. (1992). Learner diaries: Possibilities and pitfalls. Edinburgh: Institute for Applied Language Studies. (ERIC Document Reproduction Service No. 350-828)

Jensen, K. B. (1991). Introduction: The qualitative turn. In K. B. Jensen & N. W. Jankowski (Eds.), A Handbook of Qualitative Methodologies for Mass Communication Research (pp. 1-11). London: Routledge.

Marton, F., & Säljo, R. (1976). On qualitative differences in learning, outcome and process I and II. British Journal of Educational Psychology, 46, 4-11, 115-127.

Marton, F., & Säljo, R. (1984). Approaches to learning. In F. Marton, D. Hounsell & N. Entwistle (Eds.), The experience of learning. Edinburgh: Scottish Academic Press.

Morgan, A. (1991). Research into student learning in distance education. Victoria, Australia: Centre for Distance Learning. (ERIC Document Reproduction Service No. ED 342 371)

Parer, M. S. (1988). Student experience of external study. Victoria, Australia: Centre for Distance Learning. (ERIC Document Reproduction Service No. ED 311 880)

Säljo, R. (1979). Learning about learning. Higher Education, 8(4), 443-51.

Smith, P., & Kelly, M. (1987). Distance education and the mainstream: Convergence in education. London: Croom Helm.

Willis, B. (1993). Distance education: A practical guide. Englewood Cliffs, NJ: Educational Technology Publications.

Community College Demographics and Innovativeness Toward Distance Education: Is there a Correlation?

Jodi Lynn Rude
Iowa State University

Introduction

Many states have turned to distance instruction to solve educational problems related to large rural areas and limited economic resources (Currer, 1991). Community colleges in particular have embraced distance education as an instructional method. A variety of factors may influence whether a community college is innovative toward distance education. The purpose of this study was to see if innovativeness in distance education was related to community college institutional characteristics.

Carr (1985) conducted a study of Florida vocational educators to determine their attitudes toward educational change and how flexible they were. Two of five key research questions involved demographic factors and whether they were predictive of attitude and innovativeness. Dennison and Behnke (1993) designed a study "to determine the extent to which innovative activities vary among Canada's community colleges and to what degree specific organizational characteristics correlate with institutional innovativeness" (p.223). These studies were similar to this research because they examined the relationship between organizational characteristics and innovations.

Methodology

Three types of instruments were designed for this study. The Distance Education Nomination Form (DENF) was used only for identifying persons who were knowledgeable about distance education at each community college. The Distance Education Survey (DES) was designed to measure perceptions of organizational innovativeness in distance education. The Community College Information Survey (CCIS) was designed to gather general community college enrollment, graduation and distance education information.

Community college presidents were asked on the DENF to name three individuals at the institution: (a) a telecommunications leader, (b) a vice-president of academic affairs, and (c) an instructor who taught on the Iowa Communications Network (ICN), Iowa's two-way full motion interactive television system. These individuals were asked to complete the DES. The CCIS was sent to each community college president's office.

Discussion of Results

General Scores on DES

The DES instrument produced one score indicating an individual's perceptions of the institution's innovativeness toward distance education. A low number indicated more innovativeness. DES scores, calculated by averaging individual item ratings, ranged from 25 to 100 with a mean and standard deviation of 61 an 19.1, respectively. When averaging scores of the three respondents from each community college, the community college scores ranged from 35.7 to 81 with a mean and standard deviation of 61.2 and 13.1, respectively.

All Iowa community colleges scored on the innovative end of the scale. There were no DES scores above 100 (25 is the lowest possible score and 175 the highest). The scores indicated that many officials believed that their institutions were innovative toward distance education.

Respondents' perceptions about their institution tended to be consistent. With the exception of four institutions, individual DES scores from each community college tended to cluster, indicating that respondents tended to agree about their community college's innovativeness toward distance education. When the scores were placed on a continuum, community college E had the lowest DES score and community college K had the highest.

BEST COPY AVAILABLE

CCIS Characteristics

Several generalizations can be made about Iowa's community colleges by examining the CCIS data. Information about what community colleges are doing with distance education and the ICN can be used as baseline data and tested in future years to see if progress is being made.

Seventy-eight percent of the community colleges were planning to add an additional ICN classroom, paid for from the community college budget. Over half anticipated the room would be completed within six months. This figure demonstrated that many of the institutions were interested in more active involvement in distance education.

The number of ICN courses being taught at community colleges ranged from one to 18. The average number of courses taught among the 12 colleges responding to the question was six.

Community colleges used a variety of methods for selecting instructors to teach over the ICN, including: (a) course need, (b) voluntary basis, (c) those who had training on the ICN, (d) instructor availability, (e) teacher effectiveness, (f) interviews, and (g) instructor interest in distance education. There were no standardized criteria for selecting instructors.

Nearly all of the community colleges trained instructors in distance education. Sixty-one percent of the institutions reimbursed educators for teaching on the network. At many institutions, however, instructors did not receive a reduced teaching load. Table 1 summarizes the CCIS data.

Research Questions

Research question 1

What relationships do Iowa community college institutional characteristics have to the college's perceived level of distance education innovativeness?

Correlations were calculated between community college DES scores and information obtained on the CCIS to determine whether there was an association between certain characteristics and DES scores.

The correlation between the averaged DES scores and the number of years spent by the respondent at the institution was -0.43. The more years the respondent had worked at the community college, the lower the DES score.

Research question 2

What are the characteristics of community colleges whose DES scores indicate they are most innovative and least innovative toward distance education?

Table 1. *Summary of CCIS data and DES scores for 15 community colleges*

Item	N
Institution's budget trend for last 5 years	
Rising considerably	2
Rising a little	8
No change	3
Declining a little	1
Declining considerably	0
Institution's past enrollment trends	
Rising considerably	4
Rising a little	8
No change	2
Declining a little	0
Declining considerably	0
Projected enrollment trends for next 5 years	
Rising considerably	2
Rising a little	5
No change	6
Declining a little	1
Declining considerably	0
Intend to have additional ICN classroom	
Yes	11
No	0
Perhaps	3
Timeline for additional ICN classroom	
Within 6 months	6
Within 1 year	2
Within 2 years	2
Other	1
Funding for additional ICN classroom	
Community college budget	9
Other	2
Number of classes currently taught on ICN	
One	1
3-5	4
6-10	5
Over 10	1
Process used to select ICN instructors	
Course need	6
Teacher availability	1
Interest in distance education	2
Voluntary	4
Teacher effectiveness	5
Training on ICN	1
Interviews	1
Kind of ICN training instructors received	
Technical training	13
Teacher training	12
Number of community colleges:	
With a telecommunications committee	12
Using ICN for student advising	1
Providing financial compensation to ICN instructors	8
Developed a manual for ICN teaching	5
DES score	Mean=61

novative toward distance education?

Table 2 lists the characteristics of community colleges E and K. Community college E had the lowest DES score (most innovative) and community college K had the highest DES score (least innovative). Community college K's budget rose slightly during the past five years while community college E's did not change. When examining enrollment trends, community college E's past trend rose a little, while community college K's rose considerably. Community college E reported no change in projected enrollment over the next five years while community college K predicted a slight rise.

Projected timelines for completion of new distance education classrooms differed; six months for community college E and one year for community college K. Community college E taught three classes on the ICN while community college K taught nine during the spring of 1994. Community college K formed a telecommunications committee, did student advising over the network, and gave ICN instructors a reduced teaching load. Community college E developed a distance education teaching manual and gave their instructors financial compensation to teach over the ICN, but did not reduce their teaching load.

Summary

The purpose of the study was to see if distance education innovativeness was related to institutional characteristics. After correlating average DES scores and CCIS data, only one conclusion could be made; the more years the respondent worked at the community college, the lower the DES score; indicating a perceived higher level of innovativeness.

Rogers (1983) indicated that several variables were linked to innovativeness in an organization. The larger the staff and budget, for example, the more innovative the institution. This study does not support Rogers' research. Neither annual budget nor total student enrollment was found to have a statistically significant correlation with DES score.

It appears that community college DES scores were not indicative of what a community college was doing in distance education. Logically, an institution with a lower DES score should be teaching many classes over the ICN, have a telecommunications committee, and have reductions in teaching loads for their instructors. When comparing the lowest and highest DES scores, the lowest (more innovative) community colleges lacked some of these characteristics. Community colleges with higher DES scores were doing many positive things with distance education, in some cases more than those with lower DES scores (more innovative).

Individuals may be perceiving distance education innovation differently than what is actually occurring at their institution. Community college K was doing a lot in the area of distance education. Their faculty taught nine classes over the ICN during the spring of 1994. They were giving instructors reduced teaching loads for working on the ICN, and had developed a telecommunications committee. This was more than community college E had accomplished.

Table 2. *Comparison of characteristics of community college E and community college K*

Item	Community College E	Community College K
Budget trend for last 5 years	no change	rising a little
Past enrollment trends	rising a little	rising considerably
Projected enrollment trends for next 5 years	no change	rising a little
Intend to have additional ICN classroom	yes	yes
Projected timeline for additional ICN classroom	within 6 months	within 1 year
Method of paying for additional ICN classroom	CC budget	CC budget
Number of classes currently taught on ICN	3	9
Process used to select ICN instructors	Teacher effectiveness	Course needs and teacher effectiveness
Kind of training instructors received	technical/teacher	technical/teacher
Telecommunications committee	No	Yes
Use ICN for student advising	No	Yes
Financial compensation for ICN instructors	Yes	No
Reduced teaching load for ICN instructors	No	Yes
Manual for ICN teaching	Yes	No
Average DES score	36	81

There was no apparent relationship between institutional characteristics and the perceived level of distance education innovativeness. Iowa community colleges seemed to have moved at their own pace in the area of distance education. The use of it at each institution depended on need at that particular time. Community colleges who saw distance education filling a particular role moved quickly and could be considered more innovative. DES scores did not necessarily reflect that.

This research, however, provided several interesting results regarding the ICN and community colleges.

- Nearly all of the community colleges were planning on adding an additional classroom, over half of them in the next 6 months.
- A majority of the community colleges indicated that the classrooms would be paid for from the community college budget.
- The number of courses taught over the ICN ranged from 1 to 18 classes.
- Nearly all of the community colleges trained their distance instructors .
- Most distance instructors received monetary support, but not necessarily a reduced teaching load.

There is a need for additional research in the area of community colleges and distance education. Attitudinal research needs to be done to determine current attitudes. Follow-up studies need to be conducted to determine if attitudes change as community colleges begin to see the benefits of distance education.

This study should be duplicated with more subjects completing the DES to provide a truer picture of how innovative the community college is towards the ICN. Also, CCIS questions should be more specific. Inquiring about the types of classes taught and what specific type of training instructors received are two of the areas that could be explored further.

References

Carr, G. H. (1985). Characteristics of Florida educators and their receptivity to and attitude toward educational change and innovation. Atlanta, GA: American Vocational Association Convention. (ERIC Document Reproduction Service No. 266299)

Currer, J. M. (1991). Distance learning using digital fiber optics: Applications, technologies, and benefits. Oneonta,NY: Eastern Stream Center on Resources and Training. (ERIC Document Reproduction Service No. 332845)

Dennison, J. D. & Behnke, W. W. (1993). Innovativeness and related factors in Canada's community colleges. Community College Journal of Research and Practice, 17, 233-248.

Rogers, E. M. (1983). Diffusion of Innovations (3rd ed.) NewYork: The Free Press.

Attitudes of Community College Students Toward Interactive Television Instruction

Christine K. Sorensen
Iowa State University

> The question is not if there will be more distance learning in tomorrow's education. The question is do we in higher education intend to move into the future to respond to the demand for distance delivered educational experiences. (Jorgensen, 1986, p. 9)

Introduction

Recent innovations in technology have blurred the boundaries between distance and traditional education (Garrison and Shale, 1987). Cable, satellites, computers, and fiber optics have expanded distance education opportunities, and although distance education has its historical foundations in correspondence study, today, distance education more typically refers to simultaneous delivery of instruction using telecommunications technologies that allow live audio and/or video interactions. The focus has shifted from individualized instruction to small group interaction (Barker, Frisbie, & Patrick, 1989).

The field of distance education is rapidly changing with the proliferation of new technologies. One of the most recent technologies is two-way interactive video instruction offered over fiber optic networks. In the past few years the state of Iowa invested in the construction of a statewide fiber optic network, the Iowa Communications Network (ICN), connecting universities, community colleges, and public schools. With the aid of a federal grant, provided through the Star Schools Program, 103 two-way interactive video classrooms were connected to the system and became operational in October, 1993.

Iowa, with its focus on two-way fiber optic video instruction, illustrates the shift in distance education to group methods of instruction which allow "...sustained interaction among teacher and students..." (Garrison, 1990, p. 18), similar to the traditional classroom. As one author stated,

> What really changes the concept of distance education is the fact that we can electronically assemble a class of students who may interact not only with the teacher but with each other. The result is that distance education is no longer necessarily an independent and isolated form of learning but instead, begins to approach the interactive ideal of an educational experience. (Garrison, 1990, p. 15)

The Star Schools grant was provided to the Iowa Distance Education Alliance, an entity formed through the collaborative efforts of the state universities, the Area Education Agencies, the community colleges, Iowa Public Television, the Iowa Department of Education, and public school districts. Evaluation of the project was included as a key component of the grant. The evaluation plan included assessment of the effectiveness of the state's fiber optic network in providing instruction through measuring attitudes of both instructors and students taking classes via the ICN. The assessment of student and instructor attitudes was part of the formative and summative evaluation of the project, providing both information for use in refining the system and a measure of satisfaction with the system.

An Evaluation Model

> As important as it is to determine the effectiveness (producing the desired effect; efficiency) of an innovation, we must invest as much energy in determining the 'affectiveness' (influencing the emotions) in order to assure maximum usage of our investments. (Wilson, 1990, p. 13)

Studies in the field of distance education began appearing after World War II and focused primarily on large distance education universities. While there have been a number of studies related to student achievement and course and materials development, evaluation of distance education programs has recently attracted more attention (Holmberg, 1987). Evaluation typically focuses on the need to improve (formative) or to describe an outcome (summative) and should be built into the distance education process and published as part of the distance education literature (Coldeway, 1988). Draper (1987) indicates that evaluation is a necessary component of any distance education program, and that it should include ways to assess attitudes of participants about their learning experience.

Evaluation can help distance educators understand the effects of this mode of instruction. Formative evaluation, in particular, can be used to assess program weaknesses and areas for improvement (Eiserman & Williams, 1987). Eiserman and Williams (1987) and Croft (1992) believe that until the field of distance learning matures, research and evaluation efforts should be focused on improving the practice rather than on testing hypotheses.

One important issue to be addressed in evaluation of distance education is the satisfaction of students (Tovar, 1989). Feedback from participants can help in redesigning the program (Jorgensen, 1986; Reed & Sork, 1990) and making instruction more effective (Alaska University, 1990). Lambert (1986) describes one of the benchmarks of quality distance learning as "happy graduates."

The purpose of evaluation is to determine what works and what doesn't, how well students are doing, and how the instruction can be improved. Evaluation helps in assessing efficiency, effectiveness, and outcomes, as well as in assessing user satisfaction (Alaska University, 1990; Rumble, 1986). Biner (1993) and Biner, Dean and Mellinger (1994) suggest that distance education evaluation efforts should start with the assessment of student attitudes and opinions preceding assessment of learning outcomes, claiming that the study of learner satisfaction in distance learning programs has been neglected, although it is an important criterion by which to judge the effectiveness and success of distance programs.

Past evaluation of the effectiveness of televised instruction has focused on grades but has neglected learner satisfaction (Biner, Dean, Mellinger, 1994). Biner (1993), in a discussion on the assessment of university telecourses, says that negative reactions can "both undermine support for the program and detrimentally affect learning" (p. 62). Biner, Dean, and Mellinger (1994) contend that learner satisfaction is an important criterion for judging the success of televised instruction and that outcomes of high learner satisfaction include lower attrition, more referrals, higher student motivation, and better learning. Assessment of student satisfaction is important in identifying problem areas and modifying the program (Biner, et al, 1994).

Biner presents the Kirkpatrick model of evaluation as a framework for evaluating telecourses. Kirkpatrick (1979) recommends that a good evaluation begin with organized measurements of reactions and feelings of those participating in the learning situation. He argues that people must like a program in order to obtain maximum benefits. The more positive the attitude, the more likely participants are to pay attention and to learn.

Previous Findings

Some studies can be found in the literature related to student satisfaction with distance education courses. Most of the studies in the area of satisfaction involve satellite-based delivery systems or televised courses. Wilkes and Burnham (1991) found a relationship between satisfaction and involvement and found that on-site students rated both areas significantly higher than distant students. These authors conclude that instructors have substantial influence on the amount of student involvement in the classroom and that instructor training may improve ratings. Dillon and Walsh (1992) found that instructor immediacy behaviors (feedback in class, expressive vocal quality, inviting student contact, etc.) were associated with student satisfaction in distance education courses.

Silvernail and Johnson (1992) and Ritchie and Newby (1989) found a significant correlation between student ratings of the effectiveness of a television class and ratings of student involvement in the class. The latter found that classes where the instructor was not physically present had significantly lower ratings on involvement and overall satisfaction than either the traditional class or the television class with the instructor present in the room (origination site classroom). It could be argued that students in television classes where the instructor is physically present (origination) are likely to have a learning experience more similar to that of a traditional classroom than to that of their remote counterparts. Egan, Welch, Page, and Sebastian (1992) found in their research that students consistently rate conventional instruction higher than distance instruction. However, Jurasek (1993) found that students at remote sites had significantly more positive attitudes than students at origination sites.

Fulford and Zhang (1993) found interaction was a critical predictor of learner satisfaction in distance education and that perceptions of interaction declined with experience in an interactive television classroom. The authors hypothesized that the effectiveness of interactive television for instruction may decrease as student experience with the system increases. However, Dille and Mezack (1991) found that lack of experience or previous experience with tele-

BEST COPY AVAILABLE

courses was not a significant predictor of success in telecourses, although they expected it to be. Another factor likely to impact the effectiveness of distance education is the number of sites involved. Multiple sites can severely curtail the amount of interactivity possible in the classroom (U.S. Congress, 1989).

Several studies have indicated that there may be differences in perceptions of distance education based on the age and gender of the student, although the direction of the difference varies. Dille and Mezack (1991) found older students performed better in telecourses and Bernt and Bugbee (1993) found that attitudes contributed more to achievement for older students. James (1984) found that younger students performed better than older students in a distance learning environment and concluded that age of students in a distance learning system impacts both affective and cognitive dimensions, with more influence on the affective. Coggins (1988) suggests that both age and gender are predictors of persistence and satisfaction with distance learning, while Ross and Powell (1990) found that women were more successful in distance education courses than men and that they made more calls to the instructor and made better use of support structures.

In reviewing the attitude studies, it appears that several perceptions were consistently found to be related to satisfaction, regardless of the medium, whether it be print-based or interactive television using fiber optics. These were perceptions about the amount of interaction in the class between students and instructor and among students in the class; the promptness of materials transferred between student and instructor; and the quality of the instructor and the instruction received.

Two factors related to satisfaction with telecommunications-based instruction were (1) technical support and training in use of the equipment and (2) the quality of the technology, i.e., the audio and video quality. In addition, there were several areas that were consistently related to satisfaction when discussing satellite instruction and other interactive television environments, such as microwave, compressed video, and fiber optics. These areas included (1) quality of the local facilitator, (2) administrative support at the local level, (3) scheduling coordination, and (4) access to adequate information. In addition, it appears that students at remote sites are less satisfied compared to students at origination sites where the instructor is generally present.

The Need

Distance education is a rapidly expanding form of educational delivery. Although the majority of distance education programs around the world are print-based, there is an emphasis in the United States on video- and computer-based methods of distance education (Keegan, 1980, 1988). Iowa has recently invested in a state-wide two-way full-motion interactive fiber optic telecommunications network, the Iowa Communications Network (ICN). Construction of the ICN was completed in October, 1993, connecting 103 classrooms across the state and linking community colleges, universities, and local schools. In 1992, the federal Star Schools Program approved an $8 million grant to the state through the Iowa Distance Education Alliance (IDEA) to demonstrate the use of this fiber optic system for K-12 instruction (Simonson, 1994). One of the goals of the project is to support research and evaluation in the area of distance education, particularly as it relates to the ICN.

The ICN is an innovative method of delivering instruction. In only a few areas of the state have students had previous experience with interactive instruction using microwave transmissions, and in nearly all of those areas, video transmission has been one-way. Iowa is a leader in the use of two-way interactive fiber optic technology for instructional delivery (Simonson, 1994). It is important that the effectiveness of this mode of delivery be assessed so that improvements can be made and others implementing this form of technology can learn from Iowa's experience.

As technological innovations change the nature of distance education, educators need to assess the attitudes and opinions of students participating in the new learning environments. Assessing attitudes is the first step in determining the effectiveness of the program and is essential in providing information needed to revise and improve the program (Martin and Rainey, 1993; Sachs, 1993).

Instrument Development

As part of the literature review, several instruments used to evaluate distance instruction were reviewed. Most of these instruments were used to evaluate satellite instruction. Among the survey instruments with constructs defined, several areas of focus appear consistently. Table 1 presents a list of these areas and an indication of the instruments that measure each construct or one similar in nature. The constructs that appear most consistently deal with the areas of instruction, technology, management, and support. Peer interaction was specified in only two of the instruments, although the issue of interaction in the classroom appears consistently in the literature. Site personnel, material delivery and communication were areas addressed in one of the instruments. It could be argued that these areas are too specific and are part of a broader construct, such as management, coordination, or support. Perception of value indicates a construct designed to assess satisfaction. Learning style, student competency, and student external factors are not appropriate constructs for evaluating the effectiveness of a system, since they are not factors an institution can control.

BEST COPY AVAILABLE

Table 1. *Areas of emphasis found in survey instruments*

	Instrument					
Areas of Emphasis	A	B	C	D	E	F
Instructor/Instruction	X	X	X		X	X
Technology/Technical Aspects	X	X	X			X
Management/Program Coordination	X	X	X		X	X
Support		X	X		X	X
Site Personnel		X				
Material Delivery		X				
Communication		X				
Learning Style				X	X	
Student Competency					X	
Student External Factors				X	X	
Peer Interaction			X			X
Perceptions of Value						X

As part of the IDEA project, an instrument was developed by the project evaluation team to assess student attitudes about their experience in these interactive television classrooms. The instrument requested demographic information, ratings on a series of four-point Likert-scale items, and responses to two open-ended questions. Data were collected across the state at both the K-12 and community college level. Support for development of the instrument and for data collection were provided in part by the U.S. Department of Education Star Schools grant (#R203 B 20001-93).

The Likert-items on the survey were grouped to form constructs based on the review of the literature. Confirmatory factor analysis and Cronbach alpha levels provide support for the constructs created from the Likert items and indicate that the instrument is a reliable measure. These constructs will form the basis of analysis presented in this article. *Technical aspects* relates to the adequacy of the equipment. *Membership* is defined as a sense of being involved and a part of the class. *Instruction* looks at the learning environment. *Course management* focuses on logistical procedures and the provision of resources to students. *Course satisfaction* reflects the students' overall attitude toward the interactive distance education experience.

Factor Analysis

The confirmatory factor analysis provided support for the five constructs. Maximum likelihood estimates were used and missing data were deleted on a pairwise basis. Both varimax and oblimin rotations were used with consistent results obtained for both. Factor loadings are reported in Table 2. In all cases, the factor loading reported is the highest loading for that item. Only four items loaded in an unexpected manner. Two of those items ("technical problems interfere with my learning" and "the fact that I am on TV inhibits my class participation") failed to load on any factor with a factor loading greater than .30. The other two items, ("remote site students receive materials in a timely manner" and "I have had no problem getting access to the classroom") loaded on the instruction and technical factors, respectively, rather than on the course management factor as predicted. These four items were analyzed as single items and dropped from the constructs. Only one other item ("it is easy to use the microphone") loaded at a level higher than .30 on more than one factor on the two rotations, however, in both cases the item loaded higher on the predicted factor (oblimin = .50 technical and .34 membership; varimax = .47 technical and .41 membership). These items were included in the technical aspects construct.

Reliability Analysis

Following the factor analysis, additional analysis was conducted to determine the reliability of the constructs. When subscale scores or constructs are used as the unit of analysis, the reliability of the subscale needs to be estimated (Suen & Stevens, 1993). Cronbach alpha is designed to estimate the reliability of the composite score from the responses to a number of items.

Cronbach alpha coefficients were determined for each of the five constructs. Standardized Cronbach Coefficient Alpha estimates indicate that the constructs are reliable, with coefficients ranging from .64 to .91. Table 3 shows the Cronbach alpha reliability estimate for each construct.

Table 2. *Factor loadings*

Factor and Items	Varimax	Oblimin
Factor 1: Instruction		
The class is well organized.	.68	.72
The instructor pays attention to remote students.	.67	.67
The classroom is free of distractions.	.55	.52
I pay as much attention as I would in a regular class.	.53	.50
The instructor is available to answer my questions.	.52	.44
It is easy to pay attention to the instructor on the TV.	.50	.47
Factor 2: Membership		
I feel encouraged to become involved in class discussions and activities.	.74	.73
I feel the instructor is speaking directly to me.	.65	.64
I feel the students at the other site are part of my class.	.57	.52
I feel like I am part of the class.	.55	.45
Factor 3: Technical Aspects		
It is easy to see the TV monitor.	.83	.89
It is easy to use the microphone.	.47	.50
It is easy to hear comments made by students at the other site.	.36	.32
Graphics and other visuals are easy to read on the monitors.	.36	.33
Factor 4: Course Management		
Enrollment and registration procedures meet my needs.	.82	.82
It is easy to get information about ITV classes.	.54	.56
I have adequate access to the resources I need.	.48	.47
Factor 5: Course Satisfaction		
I would take another ITV class.	.79	.78
I would tell my friends to take an ITV class.	.73	.72
Overall, I am satisfied with my ITV class.	.62	.56
I am learning as much in the ITV class as I would in a regular class.	.44	.38
Single Items		
Technical problems interfere with my learning in the TV classroom.		
The fact that I am "on TV" inhibits my class participation.		
Remote site students receive class materials in a timely manner.		
I have had no problems in getting access to the classroom during the scheduled class time.		

Table 3. *Reliability estimates*

Construct	Reliability estimate (Cronbach alpha)
Instruction	.84
Membership	.87
Technical Aspects	.79
Course Management	.64
Course Satisfaction	.91

Description of the Sample Population

In the Iowa Distance Education Alliance (IDEA), Iowa's Star Schools project, each of the state's 15 community college regions had a person assigned to coordinate Star Schools activities in the region. These persons were referred to as regional coordinators. Regional coordinators were responsible for the collection of data from students and instructors using the Iowa Comunications Network (ICN) for instruction.

IDEA regional coordinators were contacted in June 1994 and asked to survey all community college courses taught over the ICN during the summer session of 1994. Eight of the community colleges were offering summer courses over the ICN; seven agreed to survey all their courses. Only four of thirteen courses from the eighth community college were surveyed as this region was different from the other regions in the level of previous experience with interactive television instruction. Of the 31 courses being taught over the ICN, 22 (71 percent) were surveyed. Eighteen of the 22 courses returned surveys for a response rate of 82 percent. These 18 courses represent 58 percent of the courses being taught over the ICN by community colleges during summer session 1994. Table 4 indicates the number of ICN courses conducted in each region, the number surveyed, and the number returning surveys.

Table 4. *Survey return rates by college*

Community College	N Courses Offered	N Courses Surveyed	N Courses Returned
College A	7	7	7
College B	13	4	4
College C	1	1	0
College D	4	4	3
College E	2	2	0
College F	1	1	1
College G	2	2	2
College H	1	1	1
TOTAL	31	22	18

The courses reflected a variety of content areas including mathematics, science, literacy, vocational education, business, art, and social sciences. The number of students enrolled in each course varied from seven to 46. Return rates were generally high, although return rates in the individual courses varied considerably. Among the 18 courses, eight had return rates of over 75 percent, five had return rates between 51 and 75 percent, four had return rates of 40 to 50 percent, and one had a return rate of under 40 percent. Return rates by course are listed in Table 5.

Two-hundred and ten community college students responded to the survey. They were:

- 37% male and 63% female;
- 85% Caucasian, 5% Black American, 4% Asian/Pacific Islander, 4% Native American, 1% Hispanic, and 1% other;
- 62% under age 25 and 38% over 25;
- 31% freshman, 35% sophomores, and 35% other;
- 61% taking their first interactive television course, 27% their second, and the remainder had taken three or more television courses; and
- 51% at a remote site and 49% at an origination site.

Findings

Data collected from the community college students were analyzed in five ways. First, the frequency data indicate the level of satisfaction for each item. Second, the overall mean scores for the constructs allowed some determination of the strengths and weaknesses of the program. Third, t-test comparisons of the constructs investigated potential differences in ratings based on age, gender, experience of the students with distance education, location at an origination or remote site, and the number of sites involved. Fourth, regression analysis provided information about the most important predictors of student satisfaction. Fifth, analysis of the open-ended responses provided further information concerning student attitudes and opinions.

Table 5. *Individual course return rates*

Course	N Students Enrolled	N Surveys Returned	Percent Returned
A1 (math)	9	8	89
A2 (math)	14	13	93
A3 (business)	14	13	93
A4 (business)	17	12	71
A5 (business)	16	9	56
A6 (business)	9	7	78
A7 (business)	16	14	88
B8 (vocational)	14	9	64
B9 (math)	27	11	41
B10 (science)	31	22	71
B11 (literacy)	20	17	85
D12 (business)	27	13	48
D13 (vocational)	46	19	41
D14 (science)	15	9	60
F15 (literacy)	14	13	93
G16 (art)	14	2	14
G17 (business)	7	3	43
H18 (history)	19	16	84
TOTAL	326	210	64

Individual Items

It appears that, in general, the community college students were satisfied with their experience in the distance learning classroom. Table 6 shows the percent of students in each of the two groups agreeing with each statement. In assessing areas for improvement, a level of 25 percent dissatisfaction was set by the researcher; items where one-fourth or more of the students responded negatively were deemed areas in need of improvement. For 19 of the items, more than three-quarters of the students indicated that they were satisfied. More than 75 percent agreed that:

- they had no problem getting access to the classroom (97%);
- it was easy to see the TV monitor (94%);
- the instructor paid attention to remote site students (93%);

Table 6. *Percent of students indicating agree or strongly agree for each item by origination and remote sites*

Construct and Items	Origination %	Remote %
Construct 1: Instruction		
The class is well organized.	91	86
The instructor pays attention to remote students.	94	91
The classroom is free of distractions.	81	67
I pay as much attention as I would in a regular class.	89	63
The instructor is available to answer my questions.	91	85
It is easy to pay attention to the instructor on the TV.	81	82
Construct 2: Membership		
I feel encouraged to become involved in class discussions.	80	72
I feel the instructor is speaking directly to me.	90	75
I feel the students at the other site are part of my class.	77	68
I feel like I am part of the class.	92	88
Construct 3: Technical Aspects		
It is easy to see the TV monitor.	92	85
It is easy to use the microphone.	78	91
It is easy to hear comments made by students at other site.	87	75
Graphics and other visuals are easy to read on the monitors.	79	76
Construct 4: Course Management		
Enrollment and registration procedures meet my needs.	95	91
It is easy to get information about ITV classes.	75	75
I have adequate access to the resources I need.	86	82
Construct 5: Course Satisfaction		
I would take another ITV class.	86	87
I would tell my friends to take an ITV class.	84	80
Overall, I am satisfied with my ITV class.	94	82
I am learning as much in the ITV class as I would in a regular class.	81	74
Single Items		
Technical problems interfere with my learning.	48	38
The fact that I am "on TV" inhibits participation.	26	33
Remote site students receive materials in a timely manner.	71	59
I have no problems getting access to the classroom.	95	98

Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

- enrollment and registration procedures were adequate (93%);
- they felt part of the class (90%);
- overall they were satisfied with the course (88%);
- the instructor was available to answer questions (88%);
- the class was well organized (88%);
- they would take another interactive television class (87%);
- it was easy to use the microphone (85%);
- they had adequate access to resources such as the library (84%);
- they would tell their friends to take an interactive television class (82%);
- they felt the instructor was speaking to them (82%);
- it was easy to pay attention (82%);
- it was easy to hear comments (81%);
- they were learning as much as in a regular class (78%);
- it was easy to read graphics and other visuals on the monitors (78%);
- they felt encouraged to become involved in class discussions (77%); and
- they paid as much attention as in a regular class (76%).

There were six areas where student ratings indicate improvement may be needed. More than one-quarter of the students felt that:

- technical problems interfered with their learning (42%);
- remote site students did not receive materials in a timely manner (35%);
- being "on TV" inhibited their class participation (29%);
- students at the other site(s) were not part of the class (27%);
- there were distractions in the classroom that interfered with learning (26%); and
- it was not easy to get information about television classes (25%).

However, a breakdown of responses by origination (where the instructor was present) and remote site students shows that remote site students were less satisfied in several areas. More than 25 percent of the remote site students responded negatively on eleven of the 25 items, while only three items met this criterion for origination site students. Origination site students indicated that:

- technical problems interfered with their learning (48%);
- remote site students did not receive materials in a timely manner (29%); and
- being "on TV" inhibited their class participation (26%).

The 11 areas where remote site students were not satisfied and the percent indicating the area as a problem are listed below. The remote site students felt that:

- they did not receive materials in a timely manner (41%);
- technical problems interfered with their learning (38%);
- they did not pay as much attention as in a regular class (37%);
- being "on TV" inhibited their class participation (33%);
- there were distractions in the classroom that interfered with learning (33%);
- students at the other site(s) were not part of the class (32%);
- they were not encouraged to become involved in class discussions (28%);
- they were not learning as much as in a regular class (26%);
- the instructor was not speaking to them (25%);
- it was not easy to hear comments (25%); and
- it was not easy to get information about television classes (25%).

On most items, the percent of students responding positively was lower for remote site students compared to origination site students.

Construct Comparisons

The four-point Likert scale items on the survey were grouped into five constructs and mean scores were calculated. As can be seen in Table 7, students appear to be very satisfied with their distance education experience (mean=3.23), technical quality in the classroom appears to be adequate (mean=3.21), and the students are satisfied with the quality of the instruction they receive (mean=3.17). Overall, the students personally feel a sense of class membership (mean=3.12). The area in most apparent need of improvement is course management (mean=2.93).

Table 7. *Construct scores*

Construct and Items	Mean
Construct 1: Instruction	3.17
Construct 2: Membership	3.12
Construct 3: Technical Aspects	3.21
Construct 4: Course Management	2.93
Construct 5: Course Satisfaction	3.23

Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

T-test Analysis

The constructs were compared using the Statistical Package for the Social Sciences (SPSS). Pooled t-tests were conducted to determine if there were differences in the construct scores on the basis of gender, age, previous student experience with distance education, student location at an origination or remote site, and the use of multiple sites. A significance level of .05 was set.

Gender comparisons

There appeared to be differences in ratings of membership and instruction between males and females. In both cases,

164

Table 8. *Comparison of construct ratings by gender*

Construct	N	Mean	SD	T-value	Probability
Membership				2.05	.042
Males	75	3.07	0.56		
Females	130	2.89	0.59		
Instruction				2.35	.020
Males	75	3.19	0.55		
Females	130	3.00	0.54		
Technical Aspects				1.37	.171
Males	75	3.18	0.56		
Females	130	3.08	0.52		
Course Management[a]				-0.06	.951
Males	72	2.98	0.65		
Females	127	2.99	0.47		
Satisfaction				1.62	.106
Males	75	3.16	0.66		
Females	130	3.01	0.61		

[a] Separate t-test used due to unequal variance of samples.

Table 9. *Comparison of construct ratings by age*

Construct	N	Mean	SD	T-value	Probability
Membership				-2.65	.009
≤ 25	128	2.88	0.61		
> 25	78	3.10	0.53		
Instruction				-1.40	.157
≤ 25	128	3.03	0.57		
> 25	78	3.14	0.52		
Technical Aspects				1.10	.271
≤ 25	128	3.15	0.51		
> 25	78	3.07	0.57		
Course Management				-0.29	.774
≤ 25	126	2.98	0.57		
> 25	74	3.00	0.51		
Satisfaction				-0.62	.534
≤ 25	128	3.05	0.62		
> 25	78	3.11	0.65		

males had significantly higher ratings. Males appeared to feel more involved in and part of the class (membership) and to rate the instructor and the instructional environment more positively (instruction). There appeared to be no differences in ratings on the other three constructs (Table 8).

Age comparisons

The respondents were divided into two groups based on their age; those age 25 and under and those over age 25 (Table 9). Comparison of construct scores between these two groups indicated that there were differences in perceptions of membership based on age. Those over age 25 had significantly higher scores on the membership construct than did those age 25 or under, indicating that they felt a greater sense of involvement in the class. No other constructs were found to be significantly different.

Student experience in distance education

Previous experience with distance education classes appeared to make no difference in perceptions of students (Table 10). None of the construct scores were significantly different.

Table 10. *Comparison of construct ratings by student experience*

Construct	N	Mean	SD	T-value	Probability
Membership				-0.37	.711
First distance course	109	2.94	0.59		
Previous experience	90	2.97	0.60		
Instruction				1.60	.112
First distance course	109	3.13	0.56		
Previous experience	90	3.00	0.54		
Technical Aspects				-0.40	.689
First distance course	109	3.10	0.53		
Previous experience	90	3.13	0.55		
Course Management				-0.18	.854
First distance course	106	2.97	0.56		
Previous experience	87	2.99	0.55		
Satisfaction				0.34	.734
First distance course	109	3.10	0.61		
Previous experience	90	3.07	0.65		

Table 11. *Comparison of construct ratings by student location*

Construct	N	Mean	SD	T-value	Probability
Membership				1.76	.080
Origination site	98	3.03	0.54		
Remote site	103	2.88	0.63		
Instruction				1.97	.050
Origination site	98	3.15	0.52		
Remote site	103	2.99	0.58		
Technical Aspects[a]				0.33	.738
Origination site	98	3.13	0.60		
Remote site	103	3.10	0.47		
Course Management				0.47	.637
Origination site	94	3.01	0.57		
Remote site	101	2.97	0.52		
Satisfaction				1.14	.257
Origination site	98	3.12	0.60		
Remote site	103	3.02	0.67		

[a] Separate t-test used due to unequal variance of samples.

Location of the student

Location of the student at the origination site (where the teacher was physically present) or the remote site appeared to make a difference in ratings of instruction. Students at the origination site had significantly higher ratings of instruction than students at remote sites (Table 11), indicating a more positive perception of the instructor and the instructional environment.

Number of sites

The number of sites connected for the classes varied. Some community college classes had only two sites connected while others had up to eight sites connected. A comparison of those with two sites versus those with more than two sites showed no significant difference in student ratings (Table 12).

BEST COPY AVAILABLE

Table 12. *Comparison of construct ratings by number of sites*

Construct	N	Mean	SD	T-value	Probability
Membership				0.23	.819
Two sites	105	2.97	0.64		
More than two sites	102	2.95	0.54		
Instruction[a]				-0.55	.584
Two sites	105	3.05	0.61		
More than two sites	102	3.10	0.48		
Technical Aspects				0.59	.555
Two sites	105	3.14	0.55		
More than two sites	102	3.09	0.52		
Course Management				1.66	.099
Two sites	103	3.05	0.55		
More than two sites	98	2.92	0.54		
Satisfaction				0.00	.997
Two sites	105	3.07	0.65		
More than two sites	102	3.07	0.61		

[a] Separate t-test used due to unequal variance of samples.

Regression Analysis

Stepwise regression was used to determine the constructs most likely to predict student satisfaction. Both the satisfaction construct and the individual item related to overall satisfaction were used as dependent variables in different sets of analyses. The prediction equation remained the same for either dependent variable.

For the entire sample of community college students using the construct of satisfaction as the dependent variable, the first variable entered in the equation, instruction, accounted for 46 percent of the variance. Adding the variables of membership, course management, and technical aspects increased the variance prediction to 55 percent.

Table 13. *Stepwise regression for satisfaction*

Variable	Probability	Total R^2
All Students		
Instruction	.0000	.46
Membership	.0000	.52
Course Management	.0019	.54
Technical Aspects	.0299	.55
Origination Students		
Instruction	.0000	.40
Membership	.0000	.50
Technical Aspects	.0230	.53
Remote Students		
Instruction	.0000	.49
Course Management	.0000	.57

However, an examination of the entire sample tended to mask some differences between the variables most likely to predict satisfaction for remote students versus origination site students. When the two groups were separated and stepwise regression analysis was conducted on each subset, results were slightly different. Although instruction was the first variable entered in the equations for both groups, other variables entered were different.

For remote site students, instruction accounted for 49 percent of the variance and when course management was added, 57 percent of the variance could be accounted for. For origination site students, instruction could account for only 40 percent of the variance. Adding membership increased that number to 50 percent and adding technical aspects raised the percent of variance accounted for to 53 percent. The regression analysis results can be seen in Table 13.

Comment Analysis

As part of the survey evaluating the effectiveness of the ICN for instruction, students were asked to respond to two open-ended questions. One question asked them to describe what they liked best about taking an interactive television class, while the second asked them to provide suggestions for improvement. One hundred ten students responded to the open-ended questions out of the 210 surveys returned. The student comments were categorized (Table 14).

Positive comments

The students appeared to enjoy the ability to meet others in remote locations that the interactive television classes provide. One student commented, "You get a chance to talk with people from many different areas," while another liked "being able to meet people from other sites on TV." Not only did the students appreciate meeting other students, they also liked the opportunity to hear different views. "It gives you a chance to relate with people in other sites and you get a better variety of students with different questions and answers," was one of the comments. Another said, "I like the interaction with other students I would normally never get to meet and hear different viewpoints."

The excitement of experiencing a new technology was apparent in several comments as students said, "we learn to use new technology," "it was a new experience," it was "nice to be exposed to fiber optics," it was a "unique experience," and it is "exciting to be part of the future." One student indicated, "I like being a part of a new way to higher education." Students also appreciated their instructors and expressed it with such comments as "the instructor is fun," "the instructor is very interactive," and "the instructor is more interactive with the students."

The convenience provided by interactive television classes was another plus for the students. "Its closer to my home (1 mile instead of 50 miles) and I'm more available for my daughter," said one student. Another student commented that "It allows me to take courses offered in a location too far away to travel to," while a third replied that "It helps people who can't drive to the original site to take a certain class." One response summed it up by saying, "Its close to home and easier to take classes."

The students also appeared to like the smaller class sizes. Students commented that they liked "the smallness," the "smaller class size in a room," the "relaxed atmosphere," and the fact that "there are not many people at my site." One student stated that "there are only four people in my class and we are still able to have it!"

Other aspects identified as positive but mentioned less frequently included the ability of the ICN to provide clear visuals, the ease of use of the equipment, increased access to learning opportunities and classes, and the ability to meet the needs of special populations such as prison inmates. Others liked the fact that there was no instructor in the class, that it saved money, and that it was better than a correspondence course. Several commented that it was "just like a regular class," while others just said that they enjoyed it and "learned a lot."

Table 14. *Summary of student comments*

Comment Category	N[a]
What students liked best	
Interaction with students at other sites	37
New Learning Experience	27
Classes offered closer to home (no travel)	25
The instructor	14
Smaller class size/more relaxed atmosphere	12
Liked the equipment/better capability for visuals	10
Increased access to learning opportunities	9
Classes offered at convenient times	4
Learned a lot	6
No instructor in the class	4
Just like a regular class	4
Meets the needs of special populations	2
Saves money	2
Better than correspondance course	1
Suggestions for improvement	
Improved microphones	25
Improved camera capabilities	19
Improved transportation of materials	18
Increase participation/ineraction	13
Decrease technical problems	12
More one-on-one communication	11
Make visuals easier to read	7
Fewer class distractions/better student behavior	7
Have teacher visit remote sites	7
Keep system on at the end of class	6
Get rid of program/do not take one	4
Better access to resources (i.e. library)	3
More classes available	3
Keep room warmer	3
Changes to help students stay attentive	2
Meet remote students face-to-face	2
Improve ability to do labs	1
Improve ability to tape classes	1
Better access to the ICN room	1
Better instructor	1

[a]Numbers reflect multiple responses from 110 of 210 students.

Suggestions for change

Although the students appeared to be satisfied with the interactive television experience, there were still several aspects that they recommended for improvement through their written comments. Improving the technical capabilities of the microphones and cameras topped the list. One student said, "I would like a system installed where the instructor could hear the students talking without the use of microphones." Another said, "I can't hear when speaking and so often find that the instructor was talking about something else and never even heard my comment." A third student recommended a "better sophisticated, different type of microphone system for students." A fourth recommended "microphones that you didn't have to press a button for all the time." A fifth suggested "voice activated microphones,"

BEST COPY AVAILABLE

and a sixth identified a need to "have more automation-minded microphones." Not only did the students recommend different microphones, they also suggested a need for student training in use of the microphones with such comments as "Students at the other site don't always use their microphones so we don't know what they are saying," and " You need to develop in students less fear of using the microphone."

Cameras also needed improvements according to the students. They indicated that the classrooms "need cameras that are not fixed," "need switchable student cameras," "need a zoom lens on the remote site to see the other class better," "need swivel cameras and hidden cameras," and "need control of the cameras at the remote sites."

Transporting materials between sites and technical difficulties also caused problems for the students. Students wondered "if things could be returned more quickly," and recommended improving the "speed of material exchange." Students said they needed to "receive homework and tests back faster," and "need to get work back faster." They recommended a "better system of getting materials to remote site students," and "more effective material transport between sites." One went so far as to recommend that "I think instructors should use overnight express and return papers to remote sites via those overnight special services."

Although not specific, many students indicated that technical difficulties interfered with their learning, saying "too many technical difficulties with the system slow down class," "technical problems robbed us of some class time," "technical problems caused class to be canceled," and there were "way, way too many technical difficulties." Other students recommended "eliminating technical problems," and "debugging the electrical systems."

The students also felt that the level of participation and interaction could be improved. Some indicated that "the remote site doesn't seem to participate as much as they should," and suggested "a little more interaction between the classrooms." Some suggested ways to improve the interaction with "more class discussion," and "better interaction with the other class through group projects."

Other areas for improvement that were mentioned less frequently included making visuals easier to read (comments primarily dealing with illegible writing and difficulty reading the blackboard), having the instructor visit the remote sites, better access to resources such as the library, providing some time at the end of the class period for additional discussion with the instructor and to be sure that the instructor is not cut off, more classes provided on the system, better access to the room, and a chance to meet remote students face-to-face. Some students indicated that the room was too cold, it was difficult to conduct labs in the ICN classroom, it was sometimes hard to pay attention to the TV monitor, and that sometimes there is a need to tape record classes. Several students commented on poor student behavior in the classroom, which created distractions for others, and some suggested the need for a class monitor.

Conclusions

Overall, students appear satisfied with the distance learning experience. In summarizing the individual items, students felt the equipment was adequate and easy to use; they felt the instructor attended to students and involved them in the class; and they would take another distance course and recommend the courses to their friends. Students liked the opportunity to interact with students at other sites and remote students appreciated the opportunity to take classes without the inconvenience of traveling. Students had positive perceptions of the instructors and the technology.

It appears that students felt technical problems interfered with learning in the distance classroom, materials were not always delivered in a timely manner, it was difficult to get information about interactive television classes, classroom behaviors were sometimes distracting, "being on TV" inhibited participation for some, and although students personally felt a strong sense of class membership, that sense of membership did not always extend to the remote classroom. Remote site students also felt that they were not paying as much attention as they would in a regular class and, in some cases, that they were not learning as much. The comments of the students would seem to reflect these same concerns. In addition, the comments provide suggestions for improving the audio (microphone) and video (camera) components of the classroom. Course management is the lowest-rated among the constructs, suggesting a need for improvement in this area.

In comparing groups on the constructs, males appeared to feel more involved in the class (membership) and had a more positive view of the instructor and the learning environment (instruction); older students (over age 25) felt more involved in the class; and students at the origination site had more positive perceptions of the instructor and the learning environment. Whether or not the student had previous experience with distance education and whether there were two sites connected or multiple sites connected appeared to make no difference in ratings for any of the constructs. There also were no differences between any of the groups on technical aspects (ease of use and adequacy of the equipment), course management (registration procedures and access to information and resources), and course satisfaction (willingness to take another course and refer friends).

It appears that the quality of instruction is the primary predictor of satisfaction for both remote and origination site students, although more so for remote site students. It also appears that while course management is an important variable in determining the satisfaction of remote site students, it is much less important for origination site students. The students' sense of class membership is a more important factor for students at the origination site.

The findings would support the literature in several areas. Females may have a higher need for interaction (Belenky, Clinchy, Goldberger, and Tarule, 1986; Gilligan, 1982), both with other students and with the instructor. The literature would suggest that distance education may limit interactivity in the classroom. In this study, females had significantly lower ratings than males on both the instruction and membership constructs. The membership construct measures peer interactions while the instruction construct contains questions related to interactions with the instructor.

The literature would suggest that remote site students have less interaction with the instructor and that lack of monitoring at the remote site leads to disruptive behavior on the part of the students. This study found that remote site students rated the instruction construct significantly lower than did origination site students, where the instructor was present in the classroom. Comments suggested a need for an on-site facilitator.

Distance education is more suited to older student orientations, according to the literature. The literature indicates that interacting with other students is less important for older, nontraditional students (Hezel and Dirr, 1990; May, 1993). In this study, older students rated membership significantly higher than did younger students (under 25). This may be because they have a lower need for interaction with their peers and thus perceive the distance class environment as meeting their needs for membership.

This study found, as did Dille and Mezack (1991), that previous student experience with distance education appeared to make no difference in perceptions. Although the literature might suggest that increasing the number of sites decreases the amount of interactivity, no differences were found in this study between students in classes with only two sites (one origination and one remote) and students in classes with multiple remote sites.

Finally, the areas where students reported the most concerns are also the areas the literature identifies. Cookson (1989) used qualitative methods and found dissatisfaction with turnaround time of materials, as did Garrison (1990) in a quantitative survey. Massoumian (1989) says that problems with the technology, such as poor audio or video or equipment malfunction, can disrupt the classroom, and Massoumian (1989) and Moore, Burton, and Dodl (1991) point out that remote sites without a teacher's presence can experience disciplinary problems. Finally, many articles point out the difficulty of maintaining interactions with the remote site students.

Based on the results of this study, several recommendations are made:

- Institutions involved in distance education activities need to pay more attention to course management and support functions, particularly for remote site students.
    a) Transportation of materials between sites needs to be improved.
    b) Improvements in dissemination of information about course opportunities are needed.
    c) Adequate on-site facilitation is needed in remote classrooms.
    d) Access to resources such as library materials is needed for remote students.

- Institutions using interactive technologies need to provide the best technical quality possible.
    a) Institutions should consider options in audio (microphones) and video (cameras) equipment configurations.
    b) Institutions need to resolve technical problems as quickly as possible and establish mechanisms to assist instructors in coping with technical difficulties.

- Instructors involved in distance education activities need adequate training to allow them to be successful distance educators.
    a) Instructors need to be aware of differences among students in perceptions of interaction and the need for interaction.
    b) Instructors need to pay particular attention to involving remote site students in classroom activities and creating opportunities for remote and origination students to work together to enhance group membership.
    c) Instructors need to practice techniques, such as looking into the camera, that will help remote students feel the instructor is speaking to them.
    d) Cooperative relationships are needed with the on-site facilitators.
    e) Training is needed in creating and using appropriate visual aids.
    f) Instructors need to establish communication channels for students outside of class time.

- Students need an orientation to interactive instruction.
    a) Students need instruction on using the microphones.
    b) Ground rules need to be established to promote a distraction-free environment.

Limitations

Several limitations must be considered when reviewing the results of this study. First, as with all attitudinal research using Likert-scale instruments, one limitation is that student responses are self-reported. It must be assumed that students are responding truthfully when completing the survey.

Second, the sample size used for this research was constrained by limitations in the numbers of courses available for study. It also must be assumed that community college students enrolled in summer courses are representative of community college students taking courses during the academic year.

Third, data were gathered as part of a larger study of the effectiveness of the Iowa Communications Network (ICN). Responses of Iowans are not necessarily representative of responses of students from other geographic areas.

Fourth, the non-experimental and post-hoc nature of the study may limit the generalizability of the findings. The study did not allow for control of confounding variables, and influences such as different subject areas and different instructors were not taken into account.

Fifth, the experimental nature of the new system and students' excitement over using the newest technology may have colored their responses. A "halo effect" could have occurred. Students were also aware that they were participating in an evaluation of the system and this awareness could have affected their responses.

Sixth, some caution is recommended in the statistical interpretation of the data. Although the test-wise error rate for the t-tests was set at .05, this does not reflect the experiment-wise error rate. A total of five sets of comparisons were made on the set of student data. In order to hold the experiment-wise error rate to .05, an adjustment would need to be made (Bonferonni's adjustment) in the alpha level. By dividing the initial alpha level (.05) by the number of comparisons made (5), an alpha level of .01 is obtained. The tables above could be re-interpreted using this adjusted alpha level, which holds the experiment-wise error rate at .05.

In using a criteria of .01 alpha, it appears that age is the only variable in which there is a significant difference in the t-test analysis. This would be the most conservative interpretation. However, given the test-wise error rates of .05 reported above, it seems that some consideration should be given to the possibility that differences do exist in the perceptions of different groups of students toward their distance education experience. It is possible, however, that because of the number of comparisons conducted, the differences found could be the result of chance.

General Summary

As the literature review pointed out, distance education is growing, and changes in technology are changing the focus of distance education. Iowa is at the forefront of change as it implements use of a fiber optic network to deliver two-way, full-motion, interactive television instruction which allows two-way interaction between and among students and instructors both verbally and visually. Evaluation of the ICN and its use in education is important as Iowa demonstrates to the rest of the nation the use of fiber optic networks for interactive television instruction. One of the first areas to assess, based on an evaluation model developed by Kirkpatrick, is the satisfaction of those participating in the learning experience.

The literature documents several key areas for evaluation of student attitudes towards distance education: instruction, technology, management or coordination, support, and level of interaction. Previous studies have shown that although achievement in distance education courses may be affected by age, level of education, motivation, and locus of control, there are generally no differences in achievement between students in traditional classes and those in distance-delivered classes, or between distance students at remote sites and those at origination sites where a teacher is present.

Factors affecting persistence in distance education included the same variables found to affect achievement, plus the level of interaction in the class and the student's satisfaction with the distance learning experience. Satisfaction in distance learning environments using telecommunications was found to be related to level of classroom interaction, course management, instruction, technical support and quality of technology, local facilitation, scheduling, and access to information. In addition, the literature provides evidence of differences in levels of satisfaction between remote and origination site students (remote students were generally less satisfied) and between distance education students and students in traditional classrooms (those in traditional classrooms were generally more satisfied).

The instrument developed through the Iowa Distance Education Alliance (IDEA), Iowa's Star Schools project, was found to be useful in assessing student attitudes towards instruction in ICN classrooms. Factor analysis and reliability coefficients supported the validity of the constructs and indicated that the instrument reliably measured those constructs. Some revisions in the instrument may be necessary in the area of course management. Course management may be too broad an area. One suggestion is to break down the construct into three smaller constructs; on-site facilitation, institutional management and coordination, and instructional management issues.

BEST COPY AVAILABLE

The evaluation data suggest that overall, community college students were satisfied with courses taught over the ICN. This suggests that the ICN is an effective tool for serving the community college population. Students were generally satisfied with the equipment, although they provided suggestions for improvements. They were generally satisfied with their instructors and the level of instruction they received, and they indicated that they would take a other distance course and would recommend distance courses to their friends. The students liked the convenience provided by distance-delivered courses and appreciated the opportunity to interact with students from other areas.

Remote site students appeared to be less satisfied with the experience than were origination site students. Course management was an important variable in predicting remote site student satisfaction, while membership was more important in predicting origination site student satisfaction. The quality of instruction was an important predictor of overall satisfaction for both groups. Males held a more positive view of the instructor and the learning environment and males and older students felt more involved in the class. Previous experience with distance education and participation in a class with multiple sites had no effect on any of the measures.

Findings from the study support the findings reported in the literature. It appears that students involved in instructional activities over the ICN perceive many of the same benefits and many of the same barriers as students involved in other forms of telecommunicated instruction. Therefore, many of the suggestions for improvement generated through the evaluation are applicable to other distance education environments. Recommendations for improvement include more emphasis on support management functions, increased attention to the level of interactivity in the distance classroom, training for instructors, and an orientation for students.

Recommendations for Further Study

The following recommendations are made for further study of the use of interactive television for instruction. First, evaluations of the satisfaction of audiences other than community college students should be conducted. This would allow assessment of whether the system is more suitable for different levels of instruction.

Second, use of the instrument created for this study would allow a determination of the stability of the constructs across populations. Some revisions in the course management items and separation of that construct into three constructs might add to the usefulness of the instrument.

Third, other measures of system effectiveness should be incorporated into future studies. These measures might include learning, retention, enrollment growth, system use, cost effectiveness, and future academic success.

Fourth, qualitative studies could be conducted to aid in better understanding of the distance learning environment and the needs of students in these settings, particularly remote site students. Qualitative studies could utilize focus groups conducted over the ICN, observations conducted unobtrusively from another ICN site, or review of videotapes, all techniques that would use the system itself in conducting further research.

References

Alaska University. (1990). Evaluation in distance education at a glance. Anchorage, AL: Alaska University.

Barker, B. O., Frisbie, A. G. & Patrick, K. R. (1989). Broadening the definition of distance education in light of the new telecommunications technologies. The American Journal of Distance Education, 3(1), 20-29.

Belenky, M. R., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). Women's ways of knowing. New York: Basic Books.

Bernt, F. M. & Bugbee, A. C., Jr. (1993). Study practices education. The American Journal of Distance Education, 4(1), 10-24.

Biner, P. M. (1993). The development of an instrument to measure student attitudes toward televised courses. The American Journal of Distance Education, 7(1), 62-73.

Biner, P. M., Dean, R. S., & Mellinger, A. E. (1994). Factors underlying distance learner satisfaction with televised college-level courses. The American Journal of Distance Education, 8(1), 60-71.

Coggins, C. C. (1988). Preferred learning styles and their impact on completion of external degree programs. The American Journal of Distance Education, 2(1), 25-37.

Coldeway, D. O. (1988). Methodological issues in distance educational research. The American Journal of tion, 2(3), 36-44.

Cookson, P. (1989). Research on learners and learning in distance education: A review. The American Journal of Distance Education, 3(2), 22-34.

Croft, M. (1992). The development of adult distance education. International Review of Education, 38(2), 189-193.J., Dille, B. & Mezack, M. (1991). Identifying predictors of high risk among community college telecourse students. The American Journal of Distance Education, 5(1), 24-35.

Dillon, C. & Walsh, S. (1992). Faculty: The neglected resource in distance education. The American Journal of Distance Education, 6(3), 5-21.

Draper, J. A. (1987). Looking at tomorrow. The American Journal of Distance Education, 1(3), 57-65.

Egan, M. W., Welch, M., Page, B., & Sebastian, J. (1992). Learners' perceptions of instructional delivery systems: Conventional and television. The American Journal of Distance Education, 6(2), 47-55.

Eiserman, W. D. & Williams, D. D. (1987). Statewide evaluation report on productivity project studies related to improving use of technology to extend educational programs. Sub-report two: Distance education in elementary and secondary schools: A review of the literature. Logan, UT: Wasatch Institute of Research and Evaluation.

Fulford, C. P. & Zhang, S. (1993). Perceptions of interactions: The critical predictor in distance education. The American Journal of Distance Education, 7(3), 8-21.

Garrison, D. R. (1990). An analysis and evaluation of audio teleconferencing to facilitate education at a distance. The American Journal of Distance Education, 4(3), 13-24.

Garrison, D. R. & Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. The American Journal of Distance Education, 1(1), 7-17.

Gilligan, C. (1982). In a different voice. Cambridge: Harvard University Press.

Hezel, R. T. & Dirr, P. J. (1990, June). Understanding distance education: Identifying barriers to college attendance. Annenberg/CPB Project. Washington, D.C. Syracuse, NY: Hezel Associates.

Holmberg, B. (1987). The development of distance education research. The American Journal of Distance Education, 1(3), 16-23.

James, A. (1984). Age-group differences in the psychological well-being and academic attainment of distance learners. Distance Education, 5(2), 200-214.

Jorgensen, E. S. (1986). Doing right by decision. In Distance II Conference: Improving Teaching at a Distance. Report of the Annual Conference on Teaching at a Distance. (pp. 5-17). Madison, WI: University of Wisconsin, Department of Continuing and Vocational Education. (ERIC Document Reproduction No. ED 307 848)

Jurasek, K.A. (1993). Distance education via compressed video: An evaluation. Unpublished master's thesis, Iowa State University, Ames IA.

Keegan, D.J. (1988). Problems in defining the field of distance education. The American Journal of Distance Education, 2(2), 4-11.

Keegan, D.J. (1980). On defining distance education. Distance Education, 1(1), 13-35.

Kirkpatrick, D.L. (1979). Techniques for evaluating training programs. Training and Development Journal, 33(6), 78-92.

Lambert, M. P. (1986). Effective administration and support of distance programs. In Distance II Conference: Improving Teaching at a Distance. Report of the Annual Conference on Teaching at a Distance. (pp. 56-75). Madison, WI: University of Wisconsin, Department of Continuing and Vocational Education. (ERIC Document Reproduction Service No. ED 307 848)

Martin, E. D. & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. The American Journal of Distance Education, 7(1), 54-61.

Massoumian, B. (1989). Successful teaching via two-way interactive video. Tech Trends, 34(2), 16-19.

May, S. (1993). Collaborative learning: More is not necessarily better. The American Journal of Distance Education, 7(3), 39-50.

Moore, D. M., Burton, J. K., & Dodl, N. R. (1991). The role of facilitators in Virginia's electronic classroom project. The American Journal of Distance Education, 5(3), 29-39.

Reed, D. & Sork, T. J. (1990). Ethical considerations in distance education. The American Journal of Distance Education, 4(2), 30-43.

Ritchie, H. & Newby, T. (1989). Classroom lecture/discussion vs. live televised instruction: A comparison of effects on student performance, attitude, and interaction. The American Journal of Distance Education, 3(3), 36-45.

BEST COPY AVAILABLE

Ross, L. R. & Powell, R. (1990). Relationships between gender and success in distance education courses: A preliminary investigation. Research in Distance Education, 2(2), 10-11.

Rumble, G. (1986). The planning and management of distance education. London: Croom Helm.

Sachs, S. G. (1991). Teaching thinking skills to distant learners. Tech Trends, 36(1), 28-32.

Silvernail, D. & Johnson, J. (1992). The impact of interactive televised instruction on student evaluations of their instructors. Instructional Technology, 32(6), 47-50.

Simonson, M. (1994). Two-way interactive distance education: Iowa's Star Schools project. Educational IRM Quarterly, 3(2), 10-13.

SPSS Inc. (1988). SPSS-X User's Guide (3rd ed).Chicago, IL: SPSS Inc.

Suen, H.K. & Stevens, R.J. (1993). Analytic considerations in distance education research. The American Journal of Distance Education, 7(3), 61-69.

Tovar, M. (1989). Representing multiple perspectives: Collaborative-democratic evaluation in distance education. The American Journal of Distance Education, 3(2), 44-56.

U.S. Congress, Office of Technology Assessment. (1989). Linking for learning: A new course for education. (OTA-SET-430). Washington, DC: U.S. Government Printing Office.

Wilkes, C. W. & Burnham, B. R. (1991). Adult learner motivations and electronic distance education. The American Journal of Distance Education, 5(1), 43-50.

Wilson, B. (90). Student's assessment of distance learning. Paper presented at the Annual Meeting of the Mid-South Educational Research Association. New Orleans, LA. (ERIC Document Reproduction Service No. ED 326 588)

An Assessment of Family and Consumer Sciences Educators' Knowledge, Interest and Attitude toward Adult Education Delivery via the Iowa Communications Network

Debra Taylor, Margaret Torrie, Cheryl Hausafus
Iowa State University

Introduction

In the development and implementation of educational programs, adult educators have a wide latitude from which to choose when selecting appropriate instructional delivery methods. Many methods are available and accessible. However, educators must first understand themselves and their own self development prior to the selection of an instructional delivery method.

The education of adults is a diverse and complex process affecting many people from all walks of life (Verduin, Miller & Greer, 1979). Diversity is not only in the types of programs and courses, but also in the types of individuals who provide instruction for adults. Educators represent various educational backgrounds, training and experiences. Therefore, when adults teach adults, a re-examination of the educators' beliefs and values is needed — beliefs and values that are related to chosen mental models of past educational experiences. Although traditional instructional delivery methods are perceived as the "best way" to influence learning, they are expected to be no longer in demand as new technologies develop.

Prior research studies conducted on how adult audiences should be taught and how they learn best have focused on a generalized population rather than in specific subject areas. Seitz (1988) recognizes that the greatest growth in adult learning has occurred in subject areas related to social life, recreation, and personal and family life. Olson (1996) suggests that adult education in the area of family life skills is critical because of social and economic changes in the country. Thus, the profession of Family and Consumer Sciences has much to contribute to adult education in recognizing instructional delivery methods that encompasses learning, work and leisure. However, little is recognized in relation to how technology can be used to reach adult audiences interested in the aforementioned subject areas.

One such approach involving technology is distance education. Iowa's approach to distance education is based on the belief that live, two-way interaction is fundamental to effective learning (Simonson, 1995). This interaction is made possible within the state by the Iowa Communications Network. This fiber optic system provides live, two-way interaction that allows both the educator and the audiences to interact simultaneously from multiple sites, regardless of the distance.

Despite the capabilities of the Iowa Communications Network, distance education continues to create the image of a single source of information having little interaction among educators and learners. Some feel that the traditional values of education and increased use of technology are incompatible with one another (Simonson & Schlosser, 1995). Moreover, cited literature implies that the Iowa Communications Network was made available for use before it was adequately encouraged.

Innovations are adopted at different rates. The completion of its diffusion process depends on the possession of what Rogers (1995) refers to as elements. These elements include the innovation, communication, time and social systems. Keeping the components of the diffusion process in mind and recognizing the continuous growth of adult learners, adult educators in Family and Consumer Sciences must continue to prepare for such technological innovations such as the Iowa Communications Network. However, the rate at which the Iowa Communications Network is diffused depends in part on the educators' willingness to incorporate its use as a means of instructional delivery.

At present, the use of fiber optic telecommunications has not been widely incorporated by adult educators in Iowa distance study programs related to Family and Consumer Sciences subject areas, but the opportunity is there. For Family and Consumer Sciences, telecommunications stands to be a vital tool for planning course materials in distance studies.

Such research can be helpful to further opportunities for adult learners in this newly defined form of distance education. Funding for such programs may be enhanced through the participation and experimentation with the Iowa Communications Network. Major research questions for this study included:

1. Are personal beliefs and attitudes related to knowledge and interest of distance education and the Iowa Communications Network?

2. Are personal beliefs and attitudes related to demographic characteristics?

3. Are demographic characteristics related to knowledge and interest?

4. Are the beliefs and attitudes, knowledge, and interest of professionals different than those of paraprofessionals in work related occupations?

Methodology

The purpose of this study was to assess the attitude of Family and Consumer Sciences adult educators toward using the Iowa Communications Network as an instructional tool and to determine how factors related to personal belief and attitudes, knowledge and interest influence the decision to use the network.

To accomplish the proposed objectives, the instrument was designed by the researcher. The instrument was based on a Likert-type scale consisting of a knowledge and interest section, an attitude section and a demographics section.

Items in section one were based on a scale form 1 to 5, with 1 representing "not having any knowledge" and 5 representing "knowing enough" about the given concept. Additionally, respondents were also asked to rank their level of interest to the same concepts. Items were again based on a scale from 1 to 5, with 1 representing "having no interest" and 5 representing "very interested". Items contained concepts about distance education, distance education in Iowa, the Iowa Communications Network and the Iowa Communications Network classroom.

Section two was also based on a 5-point Likert-type scale. Respondents were asked to rank their attitude about nontraditional vs. traditional education, face-to-face instruction vs. separation of the educator and learner and possible implementation of distance education practices using the Iowa Communications Network as an instructional tool.

Section three recognized demographic characteristics such as the respondents' current position, age, gender, ethnicity and educational background. They were also asked about their experience with the Iowa Communications Network.

A population of adult educators in Family and Consumer Sciences in work related occupations was used to obtain response. The population was purposely selected. Respondents represented four positions within the organization, however, for this study, they will be categorized as professionals and paraprofessionals for confidentiality. Out of 164 questionnaires, 103 were usable for a response rate of 62%.

The respondents were to record their responses directly onto the questionnaire. The responses were taken from the questionnaires and into the researcher's Vincent account. Analysis was done by applying Statistical Package of Social Sciences (SPSS) version 4.0. Frequency counts, means and standard deviations were calculated for each item. Chronbach alpha was used to test the reliability of the scales. One-way ANOVA and t-test were used to determine statistical differences among selected variables.

Results

Demographic Characteristics

A population of adult educators in Family and Consumer Sciences in work related occupations was selected to obtain responses. Eighty-two percent of the respondents were professionals and eighteen percent were paraprofessionals.

Years of experience in their current position ranged from the respondent's first year to sixteen years and over. 4% were first year, 19% were one to three years, 15% were four to six years, 14% were seven to nine years, 7% were 10-12 years, 10% were 13-15 years and 31% were 16 or more years.

Ninety-four percent (98 respondents) of the respondents were female, white and 6% were male, white. One percent represented blacks, Hispanics and Asians or Pacific Islanders. Age ranged from the lowest percentage (2%), 60 and over to the highest percentage, 53% representing 41-50 years of age. Educational background ranged from 82% having earned a high school diploma to 22% had earned a bachelor's degree and 2% a doctorate. The highest percentage in a specialized area of Family and Consumer Sciences was represented by food and nutrition (32%). Over half of the respondents were 41-50 and had earned a master's degree.

Table 1. Respondents' Demographic Characteristics

Characteristics	N	%
Position		
Professional	84	82
Paraprofessional	19	18
Years of Experience		
1st year	4	4
1-3 years	20	19
4-6 years	16	15
7-9 years	14	14
10-12 years	7	7
13-15 years	10	10
16 and over	32	31
Gender		
Female	97	94
Male	6	6
Age		
Under 30	2	2
31-40 years	22	21
41-50 years	54	52
51-60 years	23	22
60 and over	2	2
Ethnicity		
White, not Hispanic	98	95
Black, not Hispanic	1	1
Hispanic	1	1
Asian or Pacific Islander	1	1
Educational Background		
HS Diploma	8	8
Associate Degree	3	3
Bachelor's Degree	23	22
Master's Degree	66	64
Doctorate Degree	2	2
FCS Specialty		
Education	23	28
Food and Nutrition	26	32
Child Development	5	6
Family Life & Human Development	17	21
Family Resource Management	11	13

Knowledge, Interest and Attitude

Respondents were asked to rank their level of knowledge and interest to concepts related to distance education, distance education in Iowa, the ICN and the ICN classroom. Scales were computed to determine the degree of knowledge, interest and attitude for the total group. Then, a second computation showed the paraprofessionals vs. the professionals. Chronbach alpha reliability scores were calculated for each scale. The alpha reliability coefficient showed .97 for knowledge and interest and .76 for attitude.

Statistics showed that as a whole, the group had "little" to "some" knowledge (mean=2.5) and their interest level ranged form having "some" interest to being "quite" interested (mean=3.2). In comparing the two groups, the professionals know "little" to "something" (mean=2.6), while the paraprofessionals knowledge ranged form "not knowing anything" to "knowing little". Overall, the group had "some" interest.

Respective to knowledge, the professionals were more interested (mean=3.2) than the paraprofessionals (mean=2.9). The groups ranged from "neutral" to "having some degree of agreement" (mean=3.7) in their responses to the attitude statements. A correlation of the scales showed that interest was a contributing factor related to attitudes among paraprofessionals, even though both groups showed similar attitudes.

Demographic Characteristics by Knowledge, Interest and Attitude

T-tests (at the .05 level) were used to identify whether there was a significant difference in knowledge, interest and attitude of professional and paraprofessionals with varied educational backgrounds. T-tests ere also used to identify differences between groups who had either experienced the ICN as a learner or had experienced the ICN as both an educator and a learner.

Among the respondents who had earned a bachelor's degree or less and those who had earned a master's degree or more, results showed a significant difference ($P<.05$) between the two groups in terms of knowledge. However, no significant difference existed in terms of interest($P>.05$) or in terms of attitude ($P>.05$).

BEST COPY AVAILABLE

Table 2. T-test results of knowledge, interest and attitude by educational background.

	N	M	SD	t-value	Probability
Knowledge					
Bachelor's and under	34	2.08	.59	-4.42	.00
Master's and over	69	2.65	.63		
Interest					
Bachelor's and under	34	3.00	.89	-1.74	.08
Master's and over	69	3.30	.62		
Attitude					
Bachelor's and under	34	3.80	.43	.84	.40
Master's and over	69	3.70	.36		

Among the respondents who had experienced the ICN as a learner and those who had experienced the ICN as both an educator and a learner, results showed a significant difference (P<.05) between groups in terms of knowledge. There was no difference between the groups in terms of interest (P>.05) or attitude(P>.05).

Table 3. T-test results of knowledge, interest and attitude by ICN experience.

	N	M	SD	t-value	Probability
Knowledge					
As a learner	41	2.32	.52	-4.17	.00
Educator and learner	50	2.81	.58		
Interest					
As a learner	41	3.32	.68	.56	.57
Educator and learner	50	3.23	.70		
Attitude					
As a learner	41	3.84	.38	1.01	.31
Educator and learner	50	3.80	.41		

ANOVA and Scheffe post hoc (at the .05 level) was used to identify whether there were significant differences between age groups of under 40, 41-50 years and 51 years and over. The same procedure was used to identify whether there were significant differences between professionals and paraprofessionals in specialized areas of Family and Consumer Sciences.

Results showed no significant difference (F=.73, P=.49) between those under 40, 41-50, and 51 years and over in terms of knowledge. In terms of interest, results showed no significant difference (F=1.03, P=.36) between the three groups. No significant difference (F=.21, P=.81) existed between the three groups in terms of attitude.

Table 4. ANOVA results of knowledge, interest and attitude by age.

	N	M	SD	F Ratio	Prob.	Scheffe
Knowledge						
Under 40 (A)	24	2.50	.51	.73	.486	None
41-50 years (B)	54	2.52	.69			
51 & over (C)	25	2.32	.75			
Interest						
Under 40	24	3.20	.68	1.03	.360	None
41-50 years	54	3.20	.66			
51 & over	25	2.90	.91			
Attitude						
Under 40	24	3.79	.43	.21	.809	None
41-50 years	54	3.78	.34			
51 & over	25	3.73	.48			

In terms of knowledge, results showed a significant difference(F=7.58, P=.001) between those respondents specializing in Family and Consumer Sciences education, Food & Nutrition, and Child Development & Family Resources. Scheffe analysis showed no difference between Family and Consumer Sciences education and Child Development and Family Resources, however, results showed a difference between Family and Consumer Sciences education and Food & Nutrition, and a difference between Food & Nutrition and Child Development & Family Resources. Results showed no significant difference (F=.93, P=.40) between the three groups in terms of interest and no difference between the groups in terms of attitude.

Table 5. ANOVA results of knowledge, interest and attitude by FCS specialty.

	N	M	SD	F Ratio	Prob.	Scheffe
Knowledge						
FCS Education (E)	23	2.8	.54	7.58	.001	E>F
Food & Nutrition (F)	26	2.1	.76			C>F
Child Development and Human Resources (H)	33	2.6	.56			
Interest						
FCS Education	23	3.4	.64	.931	.398	None
Food & Nutrition	26	3.1	.94			
Child Development and Human Resources	33	3.3	.57			
Attitude						
FCS Education	23	3.8	.39	.186	.830	None
Food & Nutrition	26	3.8	.45			
Child Development and Human Resources	33	3.8	.32			

Conclusions

Distance education is a bandwagon with new riders getting on everyday. Therefore, it is critical for adult educators in Family and Consumer Sciences to recognize the need to use the ICN as an instructional tool. The purpose of this study was to assess the attitude of adult educators and to gather indications of their knowledge and interest in distance education and the ICN for future implementations of inservice programming.

Although several adult educators in Family and Consumer Sciences have already begun to use the network as an instructional tool, results of this study will help those educators in the addressing of concerns related to whether to accept or deny its use.

If education is to be funded in order to provide opportunities for adults in this newly defined form of distance education, agencies and organizations need to experience with the network as well as accept the challenge to use the network as an instructional tool in order to justify its continued use.

References

Olson, J. L. (1996). Adults' interest in family life skills. Iowa State University. Ames, Iowa.

Rogers, E. M. (1995). Diffusion of innovations. 4th edition. The Free Press.

Seitz, V. (1988). Accommodating adult learners: Distance education in Home Economics. Journal of Home Economics. 80(2), pp. 42-44. Summer. The American Home Economics Association. Washington, D.C.

Simonson. M.R. (1995). Distance education revisited: An introduction to the issue. Tech Trends for Leaders in Education and Training. October. 40(5). Association of Education Communications and Technology. Washington, D. C.

Simonson, Mr R. & Schlosser, C. (1995). More than fiber: Distance education in Iowa. Tech Trends for Leaders in Education and Training. October. 40(5). Association of Educational Communications and Technology. Washington, D. C.

Verduin, J.R., Miller, H. G. & Greer, C.E. (1977). Adults teaching adults: Principles and strategies. Learning Concepts. Austin, Texas.

A Longitudinal Profile of the Content Learning and the Attitudes of Adults Enrolled in a Graduate Degree Program Utilizing The Iowa Communications Network

Thomas S. Westbrook, Ph.D.
Drake University

Introduction

The installation of the Iowa Communications Network (ICN) enabled Drake University to extend instruction of its Master of Business Administration (MBA) degree program to students enrolled at three off-campus receive sites. The 36 credit-hour degree program was offered to admitted adult students enrolled part-time in the evenings. Two courses were offered during six semesters beginning fall 1994 and concluding summer 1996.

The overall goal of the research was to evaluate the extent to which the ICN served as an effective medium to deliver the graduate degree program. The research included a test to determine if the admission scores of the on-campus students differed from the admission scores of the off-campus or remote students, a term by term comparison of the grades earned by the on-campus and off-campus students, and a longitudinal study of the students' self-reported attitudes over the two-year degree program.

The longitudinal study began with a pre-program assessment of the students' anticipated levels of interaction, satisfaction, extent of technological interference with the overall success of the degree program classes, and impact of having four ICN locations on the classroom experience. The study continued with a periodic administration of the author-constructed survey following the first, second, fourth and sixth or last term of the degree program. This study extends previous research by Westbrook (1996) which utilized matched pair t-tests to examine the extent of change in the attitudes of the MBA on ICN students prior to and during the first term of their graduate degree program.

Research Questions

The following questions guided the study:

1. Are there significant differences in the admission profile between the students enrolled on-campus and the students enrolled at the three off-campus sites?
2. Are there significant differences in the term grade point averages between the students enrolled on-campus and the students enrolled at the three off-campus sites?
3. Are there significant differences in the anticipated and actual interaction levels between the students enrolled on-campus and the student enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual interaction levels of the students enrolled at the three off-campus sites over the two-year degree period?
4. Are there significant differences in the anticipated and actual satisfaction levels between the students enrolled on-campus and the students enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual satisfaction levels of the students enrolled in the three off-campus sites over the two-year degree period?
5. Are there significant differences in the anticipated and actual levels of technological interference with the overall success of the MBA on ICN classes between the students enrolled on-campus and the students enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual levels of technological interference of the students enrolled at the three off-campus sites over the two-year degree period?

6. Are there significant differences in the anticipated and actual levels of distraction caused by the number of remote classroom sites between the students enrolled on-campus and the student enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual levels of distraction caused by the number of remote classroom sites of the students enrolled at the three off-campus sites over the two-year degree period?

Significance and Need

Research comparing the content learning and attitudinal differences that exist between students enrolled on-campus and at remote locations is common in distance education research. Typically, the studies have examined the impact of distance learning following one class or term. This study began prior to the start of classes and continued over the duration of the degree program. This provided the opportunity to compare and track the students' academic outcomes and their attitudinal assessment of the classes utilizing the ICN. In particular, this study is unique in that it determined if differences existed in the on-campus and remote students' anticipated (pre-program) and actual (first term) levels of interaction, satisfaction, extent of technological interference, and impact of having four ICN sites. In addition, the consistency in the enrollment pattern of the remote students enabled the researcher to evaluate the extent of change in their attitudes over the two-year degree program. This study, therefore, adds to our understanding of the long-term impact of distance education on the academic outcomes and attitudes of the students enrolled in a graduate degree program.

Review of Literature

Data derived from student evaluation and assessment can serve as an excellent means to evaluate the effectiveness of a program (Sachs 1993; Simonson, Schlosser, & Anderson 1993), has been shown to provide valuable data on which to base decisions concerning course effectiveness (Sachs 1993; Simonson, Schlosser, & Anderson 1993; Martin & Rainey 1993), and can be used to alter and strengthen programs (Biner 1993; Simonson, Schlosser, & Anderson 1993; Egan, Welch, Page, & Sebastian 1992).

The most consistent finding in the literature is the similarity in academic performance between on-campus and off-campus students. It seems clear that remote students' academic performance is comparable to students who attend classes at the host institution, or students who complete coursework in a more traditional fashion (Souder 1993; Moore & Thompson 1990; Ritchie & Newby 1989; McCleary & Egan 1989; Cookson 1989; U.S. Congress 1989).

Interaction in distance education is viewed as the *sine qua non* of effective teaching practice. Moore (1989) proclaimed interaction to be a defining characteristic of education and of vital importance in the overall design of distance education. Interaction within a distance education course has been found to promote positive learner attitudes (Thompson 1990) and overall satisfaction with the instruction (Fulford & Zhang 1993).

Students enrolled at remote sites have been found to develop an *esprit de corps* through participating as a class in the distance learning environment (Thach & Murphy 1994; Moore 1994; Souder 1993). This occurs more spontaneously than traditional face-to-face instruction (Moore 1989), often leads to increased cooperation and collaboration among the students (Thach & Murphy 1994), and enhances learning (Jones & Timpson 1991).

In comparison to other distance education topics, researchers have neglected the topic of student satisfaction (Biner 1993). Clark (1993) noted that most studies indicate general student satisfaction with distance learning applications, and that most learners indicate that advancing their education would not have been possible without the distance learning course or program. Biner, Dean, & Millinger (1994) suggested that an on-going assessment of distant learner satisfaction within tele-education programs can have important program-related benefits (p. 6).

Little has been written on the extent to which the technology employed in distance learning classes or the number of remote classroom locations interfered with or distracted from the success of the degree program classes. Cyrs & Smith (1990) cited technical difficulties as a main deficiency in their review of distance learning courses.

Participants

The sample consisted of part-time graduate students enrolled in twelve MBA classes utilizing the ICN from the fall of 1994 until the summer term of 1996. The fall 1994 classes enrolled twenty-three on-campus students and thirty-one remote students. Fourteen of the remote students were enrolled at the Mason City site, ten at the Fort Dodge site, and seven at the Spencer location.

On-campus, the courses which utilized the ICN were open to a restricted number of admitted graduate students enrolled in the College of Business and Public Administration. There was little consistency in the enrollment pattern of the on-campus students. Off-campus, the thirty-one students formed a cohort group that, for the most part, remained together for the duration of the degree program.

Fifty-four students served as the sample during the pre-program phase of the study, and fifty-one students

(94.4%) completed the survey following the first term. The on-going assessment was limited to the twenty-five remote students (80.65%) who completed the pre-program, first-term, and sixth administration of the survey. (Including the data from the second and fourth terms reduced the effective sample size to 19.)

Methodology

The students' admission profiles, end of term grades, and data received from the author were used to construct pre-program and on-going surveys which were evaluated to obtain the results of the study. The pre-program and on-going surveys consisted of similarly worded questions that enabled the researcher to determine if differences existed between the on-campus and remote students prior to the start of the first term (anticipated) and throughout the two-year degree program (actual). For example, the students were asked on the pre-program survey, *To what extent do you believe you will participate by interacting with the instructor and students at the four sites in the MBA on ICN classes?* On the on-going surveys the students were asked, *To what extent did you participate by interacting with the instructor and students at the four sites in the MBA on ICN classes?*

The pre-program and on-going surveys were pilot tested by faculty and graduate students at the host institution. The surveys were also evaluated and approved by the host institution's Human Subjects Research Review Committee.

The pre-program survey was administered to the students before the start of the first class in the fall of 1994. The on-going surveys were administered following the first, second, fourth and last term of the two-year degree program. The students indicated their willingness to participate in the study on the pre-program and on-going surveys. The students' self-reported social security number was used to match the surveys in order to evaluate change in the individuals' responses. The survey questions were scored on a seven point, Likert type scale with a response of "1" indicating very little to a response of "7" indicating very much of a particular quality addressed in a survey question. The SPSS package (Version 4.1) on the Drake University VAX computer system was used to analyze the data.

Each survey question was analyzed by determining if there was a difference between the on-campus and remote students prior to the start of the degree program and following the first term. This was accomplished by conducting a separate variances t-test (Moser & Stevens, 1992). Box plots were also obtained to examine the assumption of normality.

Change in the remote students over the course of the degree program was determined by conducting a repeated measures MANOVA. Only the data derived from the pre-program, end of first, and end of sixth term were used, yielding an effective sample size ("N") of 25 students. The MANOVA approach to repeated measures was used since outcome measures that are closer together in time tend to be more highly correlated than those further apart in time. The assumption of homogeneity of covariance, required for the "mixed model" or "averaged" univariate approach, but not for the multivariate approach, is likely to be violated in such cases (Tabachnick & Fidell, 1989). Further analysis of the "period" effects were conducted by investigating the means and standard deviations at each period (pre-program, first, and sixth term).

Results

1. **Are there significant differences in the admission profile between the students enrolled on-campus and the students enrolled at the three off-campus sites?**

Admission to the University's MBA program follows the standards of the *American Assembly of Collegiate Schools of Business* and is based upon a formula that sums the student's cumulative grade point average from their undergraduate degree program and the student's score on the Graduate Management Admission Test. There was no difference in the admission scores between the MBA students enrolled on-campus and the MBA students enrolled at the three remote sites (P=.919). This suggests that the students formed a relatively homogeneous group in relation to the institution's admission criteria.

2. **Are there significant differences in the term grade point averages between the students enrolled on-campus and the students enrolled at the three off-campus sites?**

Following each term, the grades earned by the on-campus students were compared to the grades earned by the off-campus students. Drake University utilizes a 4-point grading system. No significant differences were found in the end of term grades between the on-campus and off-campus students for the twelve courses in the degree program. This means that the on-campus and remote students performed at the same academic level throughout the two-year degree program.

3. **Are there significant differences in the anticipated and actual interaction levels between the students enrolled on-campus and the student enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual interaction levels of the students enrolled at the three off-campus sites over the two-year degree period?**

There were three interaction questions on the pre-program and on-going surveys. The first question was of a general nature and sought to determine the students' anticipated and actual levels of interaction with the instructor and the students at all sites.

Prior to the start of the degree program no difference was found between the scores of the on-campus and off-campus students in their anticipated level of interaction (P=.749). Following the first term, a significant difference was observed (P=.048). The on-campus students' mean score increased while the remote students' mean score decreased. This means that the on-campus and off-campus students began the degree program anticipating the same general level of interaction with the instructors and students but ended the first term with a significant difference in their scores. The on-campus students' gain in interaction by the end of the first term was not shared by their off-campus colleagues.

Over the course of the two-year degree program no difference was found in the remote students' anticipated to actual level of interaction with the instructors and students (P=.354).

The second interaction question sought to determine if there was a difference in the on-campus and remote students' interaction level with the students at their respective site (see Table 1).

A significant difference was observed between the on-campus and remote students anticipated or pre-program level of interaction with the students at their respective site (P=.034). The remote students anticipated a significantly higher site specific interaction level with their colleagues than the on-campus students.

The students also ended the first term with a significant difference in their scores (P=.045). Overall, the on-campus and remote students began and finished the semester with significant differences in their scores with the remote students reporting a higher mean score both before and after the first term. It was of interest to note that the scores of both the on-campus and remote students increased.

There was also a significant difference in the remote students' site specific interaction level over the course of the degree program (P=.007). The remote students' mean scores increased (higher interaction) following the first term and remained stable over the two-year period.

The last interaction question sought to determine if there were differences in the on-campus and remote students anticipated and actual interaction level of the students between the four ICN classrooms.

No significant difference was found between the on-campus and off-campus students prior to the start of the degree program (P=.134) nor at the conclusion of the first

Table 1. Interaction with the Students at Specific Site

Item Tested	N	Mean	SD	P-value
1. Pre-program comparison				
On-campus	23	4.48	1.08	.034*
Off-campus	31	5.19	1.33	
2. Post-term comparison				
On-campus	21	5.33	1.24	.045*
Off-campus	30	6.00	.95	
3. Analysis of change - multivariate test for significance (pre-program to term 1 through term 6)				
Pre-program	25	5.16	1.41	
Term 1	25	6.08	0.95	.007*
Term 6	25	5.72	.89	

*p<.05

term (P=.962). This means that there was no difference in the anticipated and actual interaction levels of the on-campus and off-campus students among the four ICN sites at the beginning or the end of the first term.

A significant difference was found in the remote students anticipated to actual interaction level over the course of the degree program (P=.004). The mean score of the remote students increased (higher interaction) with each administration of the survey.

4. **Are there significant differences in the anticipated and actual satisfaction levels between the students enrolled on-campus and the students enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual satisfaction levels of the students enrolled at the three off-campus sites over the two-year degree period?**

There was no significant difference in the anticipated satisfaction level of the student enrolled on-campus and at the remote sites (P=.542). Also, no significant difference was found in the students' level of satisfaction following the first term (P=.377). In addition, there was no significant change in the anticipated to actual satisfaction level of the remote students over the two-year degree program (P=.424). This means that the students' satisfaction level did not change from their initial expectation.

5. **Are there significant differences in the anticipated and actual levels of technological interference with the overall success of the MBA on ICN classes between the students enrolled on-campus and the students enrolled at the three off-campus sites before and after the first term? Are there significant differences in the anticipated to actual levels of technological interference of the students enrolled at the three off-campus sites over the two-year degree period?**

The on-campus and remote students began the degree program anticipating the same level of technological interference with the overall success of the degree program classes (P=.309). No significant difference was found at the conclusion of the first term (P=.255). In addition, the remote students did not exhibit a significant change in their mean scores over the course of the degree program (P=.153). These findings suggest that the actual (first-term) and on-going levels of technological interference were not significantly different from what the students had anticipated before the start of the degree program.

6. **Are there significant differences in the anticipated and actual levels of distraction caused by the number of remote classroom sites between the students enrolled on-campus and the students enrolled at the three off-campus sites before and**

Table 2. Distraction Caused by Number of ICN Sites

Item Tested	N	Mean	SD	P-value
1. Pre-program comparison				
On-campus	23	3.44	1.16	.958
Off-campus	31	3.45	1.15	
2. Post-term comparison				
On-campus	21	2.66	1.32	.021*
Off-campus	29	3.55	1.24	
3. Analysis of change - multivariate test for significance (pre-program to term 1 through term 6)				
Pre-program	24	3.54	0.932	.090
Term 1	24	3.63	1.245	
Term 6	24	3.17	1.308	

*p<.05

after the first term? Are there significant differences in the anticipated to actual levels of distraction caused by the number of remote classroom sites of the students enrolled at the three off-campus sites over the two-year degree period?

The students were asked, "to what extent will (pre-program)/has (on-going) having four ICN sites distract(ed) from the overall classroom experience?" As shown in Table 2, the on-campus and remote students entered the degree program with no significant difference in the anticipated level to which having four ICN classroom locations would distract from the overall classroom experience (P=.958). They completed the first term with a significant difference in their scores (P=.021). It was of interest to note that the mean score of the on-campus students decreased (less distraction) while the mean score of the remote students remained fairly stable.

There was a marginally significant change in the mean scores of the remote students over the course of the degree program (P=.090). The mean score prior to the beginning of the degree program was very similar to the mean score at the end of the first term and then decreased by the end of the degree program. This means that the remote students' level of distraction caused by having four ICN sites lessened as the degree program progressed.

Discussion

Current distance education research is void of longitudinal studies which have examined the impact of distance education on grades earned and student attitudes over the course of a degree program. Distance education research is also void of studies which have determined if there are differences in the students' anticipated and actual levels of interaction, satisfaction, technological interference with the overall success of the MBA on ICN classes, and distraction caused by having four remote sites as they begin and complete their degree program.

The purpose of this study was to compare the admission profile, content learning and affective attitudes of the students enrolled on-campus and at remote locations in a two-year graduate business degree program which utilized the Iowa Communications Network. Fifty-four adult, part-time students served as the initial sample for the study.

The similarity found in the grades of the on-campus and remote students is consistent with the pervasive finding in the literature which has examined per course or term-specific comparisons. The results of this study suggest that the similarity of grades earned between on-campus and remote students remains consistent throughout a degree program. It would seem safe to proclaim that *distance has no veto power over learning* (adapted from Kidd, 1973).

Differences were found in the interaction levels of the on-campus and remote students. The higher post-term scores of the on-campus students may have been impacted by the instruction originating from only the on-campus location. The differences found in the site specific interaction level of the off-campus students following the first term and throughout the degree program accentuates the *esprit de corps* that develops through participating as a class in the distance learning environment (Thach & Murphy 1994; Moore 1994; Souder 1993). The results of this study suggests that the high level of site specific interaction remains constant throughout a degree program.

There was no difference found in the pre-program or end-of-term satisfaction level of the students enrolled on-campus and at the remote locations. Likewise, the remote students' level of satisfaction remained fairly consistent over the two-year degree program. The similarity suggests that offering the degree program to students at a distance and the technology employed by the ICN did not impact the satisfaction level of the on-campus students differently than the off-campus students. This finding may have been due in part to the level of interaction or involvement of the remote students. The finding is contrary to Fulford & Zhang's (1993) examination of student interaction and satisfaction which significantly decreased during a ten session class.

The similarity of the on-campus and remote students' level of technological interference with the overall success of the degree program classes would seem quite finding. Like satisfaction levels, it would appear that the ICN technology did not impact the on-campus students differently than the remote students.

The differences found in the on-campus and remote students' level of distraction of having four ICN locations on the overall classroom experience is, overall, positive. While there was a significant difference in the level of distraction following the first term, the scores of the remote students decreased a near significant level by the end of the degree program. This may suggest that there is an initial adjustment period that the remote students will have with the technology employed in a distance learning program. The finding may also imply the need to spend a significant amount of time training the students on how to use the technology employed in the ICN and other distance learning programs.

The overall conclusion from this research suggests that the ICN served as an effective vehicle to extend the on-campus instruction of the University's MBA program. This study advanced our understanding of the long-term impact of enrolling in a degree program utilizing interactive television and specifically the Iowa Communications Network. It is recommended that additional longitudinal studies be undertaken that evaluate the students enrolled in distance learning degree program utilizing the ICN and other distance learning technologies.

BEST COPY AVAILABLE

References

Biner, P.M. (1993). The development of an instrument to measure student attitudes toward televised courses. The American Journal of Distance Education, 7(1), 62-73.

Biner, P.M., Dean, R.S., & Mellinger, A.E. (1994). Factors underlying distance learner satisfaction with televised college-level courses. The American Journal of Distance Education, 8(1), 60-71.

Clark, E.C. (1993). Beam me up, nurse! Educational technology supports distance education. Nurse Educator, 18(2), 18-22.

Cookson, P.S. (1989). Research on learners and learning in distance education: A review. The American Journal of Distance Education, 3(2), 22-34.

Cyrs, T.E., & Smith, F.A. (1990). Teleclass teaching: A resource guide (2nd ed.). Las Cruces, N.M.: New Mexico State University.

Egan, M.W., Welch, M., Page, B., & Sebastian, J. (1992). Learners' perceptions of instructional delivery systems: Conventional and television. The American Journal of Distance Education, 6(2), 47-55.

Fulford, C.P., & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. The American Journal of Distance Education, 7(3), 8-21.

Jones, C.S., & Timpson, W. M. (1991). Technology mediated staff development: A retrospective case study. The American Journal of Distance Education, 5(1), 51-56.

Kidd, J.R. (1973). How adults learn. New York: Association Press.

Martin, E.E., & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. The American Journal of Distance Education, 7(1), 54-61.

McCleary, I.D., & Egan, M.W. (1989). Program design and evaluation two-way interactive television in education: Training and development research center project 18. (ERIC Document Reproduction Service No. ED 288503)

Moore, M.G. (1989). Three types of interaction. The American Journal of Distance Education, 3(2), 1-6.

Moore, M.G. (1994). Autonomy and interdependence. The American Journal of Distance Education, 8(3), 1-4.

Moore, M.G., & Thompson, M.M. (1990). Effects of distance learning: A summary of literature. University Park, PA: The American Center for the Study of Distance Education.

Moser, B., & Stevens, G. (1992). Homogeneity of variance in the two-sample means test. The American Statistician, 46, 19-21.

Ritchie, H., & Newby, T.J. (1989). Classroom lecture/discussion vs. live television instruction: A comparison of effects on student performance, attitudes and interaction. The American Journal of Distance Education, 3(3), 36-45.

Sachs, S.G. (1993). Supporting compressed video. In Hakes, B.T., Sachs, S.G., Box, C.B., & Cochenour, J. (Eds.). Compressed Video: Operations and Applications. USA: The Association for Education Communication and Technology. 180-198.

Simonson, M.R., Schlosser, C., & Anderson, M., (Eds). (1993). Encyclopedia of distance education research in Iowa. Iowa Distance Education Alliance. R203B20001-93.

Souder, W.E. (1993). The effectiveness of traditional vs. satellite delivery in three management of technology master's degree programs. The American Journal of Distance Education, 7(1), 39-53.

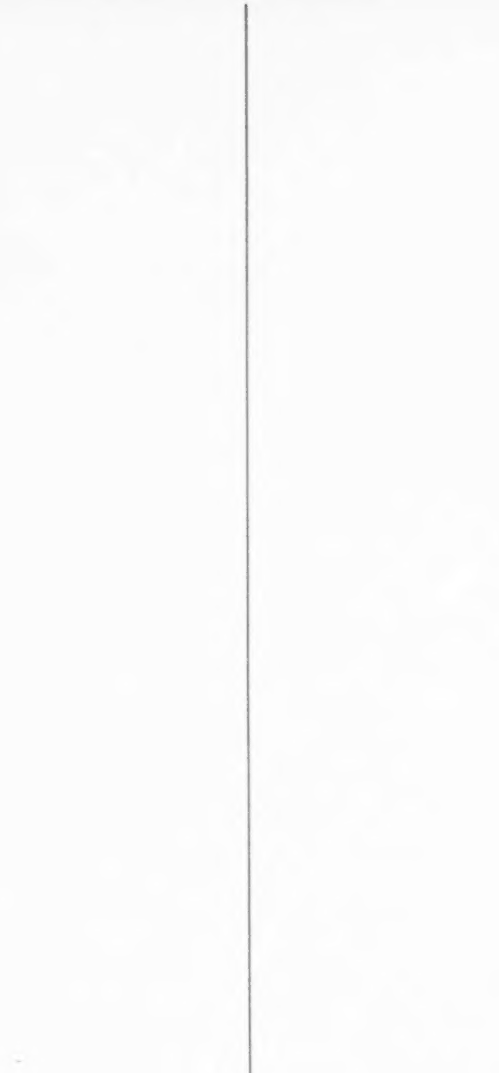
Tabachnick, B. & Fidell, L. (1989). Using multivariate statistics (2nd Ed.). New York: Harper Collins Publishers, Inc.

Thach, L., & Murphy, K.L. (1994). Collaboration in distance education: From local to international perspectives. The American Journal of Distance Education, 8(3), 5-21.

Thompson, G. (1990). How can correspondence-based distance education be improved? A survey of attitudes of students who are not well disposed toward correspondence study. The American Journal of Distance Education, 5(1), 53-65.

U.S. Congress, Office of Technology Assessment. (1989). Linking for learning: A new course for education. OTA-SET-430, Washington DC: U.S. Government Printing Office.

Westbrook, T.S. (1996). The extent of change in students' attitudes during the first term of a graduate degree program utilizing interactive television. Paper submitted for publication. Des Moines, Ia: Drake University.



Section III:

Literature Review

Distance Education:
Definition, History, Status, and Theory

Dan Hanson
Iowa State University

What is Distance Education?

It is the nature of questions that they are easier to ask than to answer. This is true of the question, "what is distance education?" for at least several reasons. First, "distance" has multiple meanings. Second, the term, "distance education," has been applied to a tremendous variety of programs serving numerous audiences via a wide variety of media. Finally, rapid changes in technology challenge the traditional ways in which distance education is defined.

Dan Coldeway, of Canada's Athbasca University, has provided a framework useful in helping to define four ways in which education can be practiced. This framework, which considers the two variables of time and place, gives insight into different approaches to the practice of distance education. Combinations of the variables result in four approaches to education. Traditional education takes place at the same time in the same place. Individual learning that occurs in a learning center is education that is practiced at different times but in the same place. The last two categories focusing on education as it takes place in different places, are of most interest to distance educators. Distance instruction can take place in different places at the same time when telecommunications are used. Students can also learn at different times and in different places (Simonson, 1995a). Coldeway has said that the purest form of distance education occurs at different times and in different places. Others would argue that distance education is best practiced at the same time, but with students in different places.

As the following definitions will show, distance education definitions go well beyond this basic framework. However, an understanding of the differing views of how distance education should be practiced will give insight into the theory of distance education being promoted by each definition.

To Rudolf Manfred Delling,

> Distance education (Fernunterricht) is a planned and systematic activity which comprises the choice, didactic preparation and presentation of teaching materials as well as the supervision and support of student learning and which is achieved by bridging the physical distance between student and teacher by means of at least one appropriate technical medium. (in Keegan, 1986, p. 58)

For Hilary Perraton, (1988) distance education is "an educational process in which a significant proportion of the teaching is conducted by someone removed in space and/or time from the learner" (p. 34).

The U.S. Department of Education's Office of Educational Research and Improvement (in Bruder, 1989) defines distance education as "the application of telecommunications and electronic devices which enable students and learners to receive instruction that originates from some distant location" (p. 30). Typically, the learner may interact with the instructor or program directly, and may meet with the instructor on a periodic basis.

Greville Rumble (1989) offered the following four-part definition of distance education:

- In any distance education process there must be: a teacher; one or more students; a course or curriculum that the teacher is capable of teaching and the student is trying to learn; and a contract, implicit or explicit, between the student and the teacher or the institution employing the teacher, which acknowledges their respective teaching-learning roles.
- Distance education is a method of education in which the learner is physically separate from the teacher. It may be used on its own, or in conjunction with other forms of education, including face-to-face.
- In distance education learners are physically separated from the institution that sponsors the instruction.
- The teaching/learning contract requires that the student be taught, assessed, given guidance and, where

appropriate, prepared for examinations that may or may not be conducted by the institution. This must be accomplished by two-way communication. Learning may be undertaken either individually or in groups; in either case it is accomplished in the physical absence of the teacher. (p. 19)

For Desmond Keegan, (1988a) the following four definitions were central to an attempt to identify the elements of a single, unifying definition of distance education:

- The French government, as part of a law passed in 1971, defined distance education as "education which either does not imply the physical presence of the teacher appointed to dispense it in the place where it is received or in which the teacher is present only on occasion or for selected tasks" (p. 6).

- According to Börje Holmberg, distance education covers the various forms of study at all levels which are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises but which, nevertheless, benefit from the planning, guidance and teaching of a supporting organization. (p. 6)

- Otto Peters emphasized the role of technology, saying that distance teaching/education (Fernunterricht) is a method of imparting knowledge, skills and attitudes which is rationalized by the application of division of labor and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialized form of teaching and learning. (p. 6)

- For Michael Moore, the related concept of "distance teaching" was defined as the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical or other devices. (p. 6)

Keegan identified five main elements of these definitions, using them to compose a comprehensive definition of distance education:

- The quasi-permanent separation of teacher and learner throughout the length of the learning process (this distinguishes it from conventional face-to-face education).

- The influence of an educational organisation both in the planning and preparation of learning materials and in the provision of student support services (this distinguishes it from private study and teach-yourself programmes).

- The use of technical media–print, audio, video or computer–to unite teacher and learner and carry the content of the course.

- The provision of two-way communication so that the student may benefit from or even initiate dialogue (this distinguishes it from other uses of technology in education).

- The quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups, with the possibility of occasional meetings for both didactic and socialisation purposes. (Keegan, 1990, in Holmberg, 1995, p.5)

Garrison and Shale (1987) argued that, in light of advances in distance education delivery technologies, Keegan's definition was too narrow, and did not "correspond to the existing reality as well as to future possibilities" (p. 13). While declining to offer a definition of distance education, Garrison and Shale offered the following three criteria they regarded as "essential for characterizing the distance education process" (p. 11):

- Distance education implies that the majority of educational communication between (among) teacher and student(s) occurs noncontiguously.

- Distance education must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the educational process.

- Distance education uses technology to mediate the necessary two-way communication.

Keegan's definition and the definitions preceding it define the traditional view of distance education. Rapid changes in society and technology are challenging these traditional definitions.

Emerging Definitions

"The contemporary period is often characterised as one of unpredictable change" (Edwards, 1995, p. 241). Globalization, brought on by supersonic air travel, satellite television, computer communications and societal changes has inspired new ways of looking at distance education (Evans, 1995). Edwards (1995) uses the term **open learning** as a way of describing a new way of looking at education in a quickly changing and diverse world. He indicates that distance education and open learning are two distinct approaches to education. While he does not define the two, he states that distance education provides distance learning opportunities using mass produced courseware to a mass market. In contrast, open learning places "greater emphasis on the current specific needs and/or markets available" by recognizing local requirements and differences instead of delivering a preestablished curriculum. Open learning shifts from mass production and mass consumption to a focus on local and individual needs and requirements. Edwards states that this can occur outside of the traditional organization of education. This is a major difference between his description of open learning and the previous definitions of distance education (Edwards, 1995, p. 242).

Improvements in technology have also resulted in another redefinition of distance education. Virtual electronic classrooms are making it possible for the first time to teach face-to-face at a distance. Live two-way audio and video communications mean that no longer do interpersonal communication and face-to-face interaction need to be eliminated when teaching at a distance (Keegan, 1995). Simonson (1996) states that "Traditional approaches to distance education based on the delivery of print and linear media technologies are no longer as relevant to the field as it is practiced in the United States" (p. 5). Based on the concept of virtual electronic classrooms he suggests the following redefinition of distance education:

> Distance education implies formal institutionally-based educational activities where the teacher and learner are normally separated from each other in location but not normally separated in time, and where two-way interactive telecommunication systems are used for sharing video, data, and voice instruction. (Simonson & Schlosser, 1995, p. 13)

This redefinition based on maturing technologies suggests a time when "the concept of distance will become relatively unimportant" (Simonson, 1995b, p. 12). Perhaps instead of looking at definitions that differentiate distance education from the rest of education, it is time to look at the ways in which the two converge (Hoffman, 1996).

The History of Distance Education

Correspondence Study

The roots of distance education are at least 150 years old. An advertisement in a Swedish newspaper in 1833 touted the opportunity to study "Composition through the medium of the Post" (Holmberg, 1986, p. 6). In 1840, England's newly-established penny post allowed Isaac Pitman to offer shorthand instruction via correspondence. Three years later, instruction was formalized with the founding of the Phonographic Correspondence Society, precursor of Sir Isaac Pitman Correspondence Colleges (Holmberg, 1986).

Distance education, in the form of correspondence study, was established in Germany by Charles Toussaint and Gustav Langenscheidt, who taught language in Berlin. Correspondence study crossed the Atlantic in 1873, with the founding, by Anna Eliot Ticknor, of a Boston-based society to encourage study at home. The Society to Encourage Studies at Home attracted more than 10,000 students in 24 years (Watkins, 1991). Students of the classical curriculum (mostly women) corresponded monthly with teachers, who offered guided readings and frequent tests.

From 1883-1891, academic degrees were authorized by the state of New York through the Chautauqua College of Liberal Arts to students who completed the required summer institutes and correspondence courses. William Rainey Harper, the Yale professor who headed the program, was effusive in his support of correspondence study, and confident in the future viability of the new educational form:

> The student who has prepared a certain number of lessons in the correspondence school knows more of the subject treated in those lessons, and knows it better, than the student who has covered the same ground in the classroom.
>
> The day is coming when the work done by correspondence will be greater in amount than that done in the classrooms of our academies and colleges; when the students who shall recite by correspondence will far outnumber those who make oral recitations. (Watkins, p. 4)

In 1891, Thomas J. Foster, editor of *The Mining Herald*, a daily newspaper in eastern Pennsylvania, began offering a correspondence course in mining and the prevention of mine accidents. His business developed into the International Correspondence Schools, a commercial school whose enrollment exploded in the first two decades of the century, from 225,000 in 1900 to more than 2,000,000 in 1920 (Rose, 1991).

In 1886, H. S. Hermod, of Sweden, began teaching English by correspondence. In 1898 he founded Hermod's, which would become one of the world's largest and most influential distance-teaching organizations (Holmberg, 1986).

Correspondence study continued to develop in Britain with the founding of a number of correspondence institutions, such as Skerry's College, in Edinburgh, in 1878, and University Correspondence College, in London, in 1887. At the same time, the university extension movement in the United States and England promoted the correspondence method. Among the pioneers in the field were Illinois Wesleyan, in 1877, and the University Extension Department of the University of Chicago, in 1892 (Holmberg, 1986).

Illinois Wesleyan offered bachelor's, master's and doctoral degrees as part of a program modeled on the Oxford, Cambridge, and London model. Between 1881 and 1890, 750 students were enrolled, and in 1900, there were nearly 500 students seeking degrees. However, concerns about the quality of the program prompted a recommendation that it be terminated by 1906 (Watkins, 1991).

Correspondence study was integral to the University of Chicago. The school, founded in 1890 and opened two years later, had University Extension as one of its five divisions, the first such division in an American university. The extension division was divided into five departments: lecture study, class study, correspondence teaching, library, and training (Watkins, 1991).

The correspondence study department of the University of Chicago was successful, at least in terms of numbers. Each year, 125 instructors taught 3,000 students enrolled in 350 courses. Nevertheless, enthusiasm within the university for the program waned, partly for financial reasons (Watkins, 1991).

At the University of Wisconsin, the development of the "short course" and farmers' institutes in 1885 formed the foundation for university extension. Six years later, the university announced a program of correspondence study led by the eminent historian, Frederick Jackson Turner. However, as at the University of Chicago, faculty interest waned. Further, public response was minimal, and the correspondence study program was discontinued in 1899 (Watkins, 1991). Correspondence study would have to wait another seven years to be reborn under a new, stronger, Correspondence Study Department within the school's University Extension Division.

Distance education began to enrich the secondary school curriculum in the 1920s. Benton Harbor, Michigan students were offered vocational courses in 1923, and six years later, the University of Nebraska began experimenting with correspondence courses in high schools (Holmberg, 1986).

In France, the Ministry of Education set up a government correspondence college, in response to the impending war. Although the Centre National d'Enseignement par Correspondences was established for the education of children, it has since become a huge distance-teaching organization for adult education (Holmberg, 1986).

The original target groups of distance education efforts were adults with occupational, social and family commitments. This remains the primary target group today. Distance education provided the opportunity to widen intellectual horizons, as well as the chance to improve and update professional knowledge. Further, it stressed individuality of learning and flexibility in both the time and place of study.

Two philosophies of distance education became identifiable. The full liberalism of programs offered by Hermod's, in Sweden, emphasized the free pacing of progress through the program by the student. Other programs, such as those offered by the University of Chicago, offered a more rigid schedule of weekly lessons (Holmberg, 1986).

Electronic Communications

In Europe, there was steady expansion of distance education, without radical changes in structure, but with gradually more sophisticated methods and media employed. Audio recordings were used in instruction for the blind and in language teaching for all students. Laboratory kits were used in such subjects as electronics and radio engineering. Virtually all large-scale distance teaching organizations were private correspondence schools (Holmberg, 1986).

In the United States, advances in electronic communications technology helped determine the dominant medium of distance education. In the 1920s, at least 176 radio stations were constructed at educational institutions, although most were gone by the end of the decade. The surviving stations were mostly at land grant colleges (Buckland & Dye, 1991).

In the early 1930s, experimental television teaching programs were produced at the University of Iowa, Purdue University, and Kansas State College. However, it was not until the 1950s that college credit courses were offered via broadcast television: Western Reserve University was the first to offer a continuous series of such courses, beginning in 1951 (Buckland & Dye). Sunrise Semester was a well-known televised series of college courses offered by New York University on CBS from 1957 to 1982 (Buckland & Dye, 1991).

Satellite technology, developed in the 1960s and made cost-effective in the 1980s, enabled the rapid spread of instructional television. Federally funded experiments in the United States and Canada, such as the Appalachian Education Satellite Project (1974-75), demonstrated the feasibility of satellite-delivered instruction. However, these early experiments were loudly criticized for being poorly planned (Albright, 1988). More recent attempts at satellite-delivered distance education have been more successful. The first state educational satellite system, Learn/Alaska, was created in 1980. It offered six hours of instructional television daily to 100 villages, some of them accessible only by air (Johnson, 1988). The privately-operated TI-IN Network, of San Antonio, Texas, has delivered a wide variety of courses via satellite to high schools across the United States since 1985.

In the late 1980s and early 1990s, the development of fiber optic communication systems allowed for the expansion of live, two-way, high quality, audio and video systems in education. While the initial cost of fiber optic systems may be high, the long-term savings and benefits of the technology outweigh the initial costs. Many now consider fiber optic delivery systems as the least expensive option for the high quality, two-way audio and video required for live two-way interactive distance education (Tompkins, 1993). The state of Iowa has the largest statewide fiber optic system. Currently the Iowa Communications Network (ICN) provides full-motion, two-way interactive video, data (Internet) and voice services to over 250 Iowa classrooms. By the year 2000, all school districts, Area Education Agencies and public libraries in Iowa will have classrooms connected to the fiber optics of the ICN. Over 100,000 hours of formal educational opportunities were offered during the first 18 months of the networks service (Simonson, 1995c).

Distance education opportunities are quickly growing through the use of computer mediated communications. Tens of thousands of networks are connected to the Internet with millions of people using the Internet worldwide (Ackermann, 1995). Both credit and noncredit courses have been offered over computer networks since the mid 80s. In most cases, a teacher organizes the course materials, readings and assignments. The students read the material, complete assignments and participate in on-line discussions with other classmates. The advent of computer conferencing capabilities has had an impact on the traditional approach to the design of distance education instruction. Computer conferencing increases the potential for interaction and collaborative work among the students. This type of collaboration among students was difficult with previous forms of distance education (Riel & Harasim, 1994).

In addition, computer networks are a convenient way to distribute course materials to students around the world. Many faculty members now use the convenient user interface of the World Wide Web to make course materials available to their students (Young, 1995). The British Open University, Fern Universität of Germany and the University of Twente in the Netherlands are some of the leading providers of on-line courses in Europe. In the United States, the American Open University, Nova University, and the University of Phoenix have been traditional leaders in providing distance education. They, along with many other universities are now offering hundreds of courses on-line (Lintz & Tognotti, 1996).

Distance Teaching Universities

The 1962 decision that the University of South Africa would become a distance teaching university brought about a fundamental change in the way distance education was practiced in much of the world. Another landmark was the founding, in 1971, of the Open University of the United Kingdom, a degree-giving distance teaching university offering full degree programs, sophisticated courses, and the innovative use of media (Holmberg, 1986). The Open University brought heightened prestige to distance education, and spurred the establishment of similar institutions in industrial nations, such as West Germany, Japan, and Canada, as well as such lesser-developed nations as Sri Lanka and Pakistan (Holmberg, 1986).

While the distance-teaching universities shared numerous similarities, they were not identical in their mission or practice. Two of the largest and most influential, the Open University of the United Kingdom and the German Fern Universität, differ widely. The British school favors employed, part-time students of above normal study age, and allows them to enroll without formal entrance qualifications. By 1984, some 69,000 of its students had completed work for the Bachelor of Arts degree (Holmberg, 1986).

The German Fern Universität, founded in 1975, offers a more rigorous program than its British counterpart. Despite strict, formal entrance requirements, it had 28,000 students in 1985. However, the dropout rate is very high, and in its first decade, only 500 students completed the full curricula for a university degree (Holmberg, 1986).

Holmberg (1986) cites numerous reasons for the founding of distance-teaching universities, including:

- the need felt in many countries to increase the offerings of university education generally;
- a realization that adults with jobs, family and social commitments contributed a large group of prospective part-time university students;
- a wish to serve both individuals and society by offering study opportunities to adults, among them disadvantaged groups;
- the need found in many professions for further training at an advanced level;
- a wish to support educational innovation; and
- a belief in the feasibility of an economical use of educational resources by mediated teaching. (p. 30)

BEST COPY AVAILABLE

Status of Distance Education

Worldwide

Distance education has a major, though varied impact worldwide. While politics and economics are influential on the how distance education is employed, there is a strong demand for distance education opportunities. Three examples follow that illustrate some of the factors that influence distance education and show the demand for distance learning opportunities.

In Sub-Saharan Africa, political instability and economic depression have caused a decline in educational standards in many countries. As the population has increased in these countries, there is a tremendous classroom shortage and the number of qualified teachers, and the availability of instructional materials are inadequate. Many countries are unable to provide locally for students qualified for university entry, and they are unable to afford the cost of sending them abroad. Distance education is seen as having the potential to contribute to national reconstruction by providing economically feasible educational opportunities to many people. Collaboration with a variety of international distance education organizations has provided expertise and support in the practice of distance education. As a result, distance education provision at a basic level has expanded quite sharply in this area of the world. However, lack of financial resources in most cases inhibits the use of even basic technologies that could improve distance learning. While, growth in distance education in Sub-Saharan African countries is evident, it does not yet have far reaching impact. Lack of funding prevents distance education institutions from reaching many of the potential students (Magnus, 1996).

China developed a national higher distance education program in the late 70s and early 80s in response to a large growth in population and a high cost per capita in the "elite and craft-like" approach to regular higher education in the country. Because China could not afford to meet the higher education needs of the expanding population, a national Radio and TV University was developed. By 1985 China had over 30,000 TV classes throughout the country and employed almost 25,000 academics. One in five students studying in higher education was enrolled in a Radio and TV University. This national system incorporated a centralized approach to course development, delivery, and examinations. However, despite an increase in offering, recent years have shown a significant decrease in student numbers. Now only one in every thirteen students in higher education is enrolled in a Radio and TV University. Socioeconomic factors have caused changes in the mass market for higher education. The centralized approach to course development and delivery no longer meets the diverse needs of learners and does not adapt itself quickly to the new conditions. In response, China's Radio and TV Universities have changed from a central system of course development and delivery to a regionally-responsive system that provide a wide variety of both diploma and non-diploma courses (Ding, 1994; Ding, 1995).

Distance Education has had a long history in the European countries. The continuation of this tradition is evident in the vast array of programs offered by European Union countries. Enrollment in these programs was almost two and three quarter million in 1994. In some countries open distance teaching universities offer the majority of the distance education programming. Spain's Universidad Nacional de Educacion a Distancia is Europe's largest distance teaching university with over 130,000 students enrolled in 1994. In other countries, traditional universities deliver the majority of the courses. France, for example has no distance teaching university, but offers higher distance education through 22 small offices within traditional universities. In 1994 they had 34,000 students enrolled in these programs. In some cases governments provide substantial distance education training opportunities that do not lead to a university degree. France is a leader in this area providing over 350,000 students a year with opportunities at a range of levels: elementary school, high school, technical and professional qualifications, teacher training, university level and postgraduate courses. In addition 250,000 students are served by proprietary distance training providers in France (Keegan, 1994).

Distance instruction in the European Union uses a wide variety of media to deliver courses. These range from traditional correspondence delivery, to computer conferencing to two-way audio and video virtual classrooms (Holmberg, 1995b; Keegan, 1995). Using these technologie, the established distance education and training organizations of Europe will continue to play a significant role in education in and beyond the European Union.

United States

In the United States, the emergence of new technologies has brought on renewed interest in distance education and learning.

> Electronic mail, electronic bulletin boards, facsimiles, and interactive computer networks now augment or replace the United States mail carriers in delivering curricular materials, textbooks, and examinations to distance learners. New transmission media capable of providing two-way, full-motion, real-time (live) interaction between the student and teacher replace non-interactive, one-way systems. (Tompkins, 1993, p. 265-266)

At the university level it is reported that distance education enrollments are in the high six figures nationally. This includes enrollment in both courses offered by traditional universities and those offered by distance learning universities (Lane, 1994 in Keegan, 1994). The United States military is heavily involved in distance education technology because distance education is viewed as a cost-efficient way to deliver technical training to a large number of students. The development of new weapons systems and other technologies increases the demand for this type of training. The Army's Interactive Teletraining Network, the Navy's Video Teletraining Network and the Air Force's Teleteach Expanded Delivery System all provide distance training opportunities for personnel across the United States and around the world (Barry & Runyan, 1995).

A focus on education in the primary and secondary schools separates American distance education from traditional European distance education (Keegan, 1994). This emphasis on K–12 students is demonstrated in the federally funded Star Schools projects. The United States Department of Education began the Star Schools program "to encourage improved instruction in mathematics, science, foreign languages, literacy skills, and vocational education for underserved populations through the use of telecommunications networks" (Simonson, 1995d, pp. 3–4). While these projects are not limited to K–12 programming, their primary emphasis is on K–12 students and teachers. A variety of network technologies including satellite, cable, fiber optics, microcomputer-based laboratories, multi-media, and electronic networking technologies have been used to deliver instructional programming to over 6,000 schools nationwide through the Star Schools Project (U.S. Department of Education, 1995).

Typically the Star Schools project has funded programs that provide satellite delivery of instruction to a large number of students in many states. One of the largest is the Connections 2000 Star Schools Project of Los Angeles County Office of Education. It is a consortium of education and public television agencies in over 10 states across the United States. The consortium provides Math, Science, Social Science, Language Arts and Technology programming to over 1,300 schools sites and 125,000 students in grades 4 through 7. In addition, the project provides professional development opportunities for over 4,000 teachers. Currently the Star Schools project funds seven of these satellite based projects (U.S. Department of Education, 1995).

The Star Schools program currently sponsors three "special statewide projects" that fund the development of statewide infrastructures allowing for real-time interaction between students and instructors. The most comprehensive is being developed in the state of Iowa. Currently, its 3000 mile statewide fiber optic network connects over 250 educational sites with over 350 more sites to be added by the year 2000. In the spring of 1996, 56,000 hours of K–12 programming were provided in addition to teacher professional development and higher education course opportunities. Kentucky and Mississippi join Iowa in the development of these statewide systems that promote personalized interactive instruction and learning (Simonson, 1995c; Sorensen, Maushak, Lozada, 1996).

As the examples described above show, distance education has a major impact worldwide. In addition to economics and politics, the growth and impact of distance education is directly linked to the availability of new technologies. "As technology links distant sites in an electronic web of information and new communication channels, people around the globe are pulled together" (Thach & Murphy, 1994, p. 5). This type of communication has contributed to the globalization of our world. Globalization implies that most people are "connected more or less contemporaneously with distant events" (Evans, 1995 p. 258) "The new computer mediated communications and telecommunications technologies are the ones which most strongly contribute to globalisation and are the ones to which distance education is most attracted." (Evans, 1995, p. 259). Distance educators will be challenged both by globalization and by the emerging technologies. How they take advantage of these opportunities will give new meaning to the practice of distance education.

Theory and Distance Education

The Need for Theory

Although forms of distance education have been in existence since the 1840s and attempts at theoretical explanations of distance education had been undertaken by leading scholars in the field, the need for a theory base of distance education was still largely unfulfilled in the 1970s. Holmberg (1986) stated that "further theoretical considerations will contribute results of a kind to give to distance educators a firmly based theory, a touchstone against which decisions can be taken with confidence" (p. 132). In 1988, Holmberg continued to recognize the need as he stated,

> One consequence of such understanding and explanation will be that hypotheses can be developed and submitted to falsification attempts. This will lead to insights telling us what in distance education is to be expected under what conditions and circumstances, thus paving the way for corroborated practical methodological application. (p. 3)

Moore was concerned about "the progress of distance education being hindered by lack of attention to what he called the 'macro factors'" (Keegan, 1986, p. 69). He indicated that in this area of education there was a need to describe and define the field, to discriminate between the various components of the field, and to identify the critical elements of the various forms of learning and teaching.

BEST COPY AVAILABLE

Keegan (1988b) reaffirmed the continued need for a theory of distance education when he said:

> Lack of accepted theory has weakened distance education: there has been a lack of identity, a sense of belonging to the periphery and the lack of a touchstone against which decisions on methods, on media, on financing, on student support, when they have to be made, can be made with confidence. (p. 63)

More recently, Keegan has added: "A firmly based theory of distance education will be one which can provide the touchstone against which decisions—political, financial, educational, social—when they have to be taken, can be taken with confidence." This would replace the ad hoc response to a set of conditions that arises in some 'crisis' situation of problem-solving, which normally characterizes this field of education (Keegan in Holmberg, 1989, p. 145).

In a general sense, theory is taken to mean a set of hypotheses logically related to one another in explaining and predicting occurrences. Holmberg stated that:

> the aim of the theoretician is to find explanatory theories; that is to say, the theories which describe certain structural properties of the world, and which permit us to deduce, with the help of initial conditions, the effects to be explained. . . Theoretical, to bring explanation, on the other hand practical, to provide for application or technology. (Holmberg, 1985, p. 5)

Keegan added,

> A theory is something that eventually can be reduced to a phrase, a sentence or a paragraph and which, while subsuming all the practical research, gives the foundation on which the structures of need, purpose and administration can be erected. (in Holmberg, 1989, p. 145)

In 1995 Holmberg gave a more specific definition of the concept of theory. He stated that a theory means:

> a systematic ordering of ideas about the phenomenon of our field of inquiry and an overarching logical structure of reasoned suppositions which can generate intersubjectively testable hypotheses. (p. 4)

Holmberg suggested that distance education has been characterized by a trial and error approach with little consideration being given to a theoretical basis for decision-making. He suggested that "the theoretical underpinnings of distance education are fragile. Most efforts in this field have been practical or mechanical and have concentrated on the logistics of the enterprise" (Keegan, 1988b, p. 63).

To some, distance education represents a deviation from conventional education. Holmberg claimed it was a distinct form of education. Keegan (1986) concluded that distance education "is a distinct field of education, parallel to and a complement of conventional education." (p. 270). Shale (1988) countered that "all of what constitutes the process of education when teacher and student are able to meet face-to-face also constitutes the process of education when the teacher and student are physically separated" (p. 26).

Cropley and Kahl (1983) compared and contrasted distance education and face-to-face education in terms of psychological dimensions and claimed neither set of principles emerged in a pure form. Peters strongly stated:

> Anyone professionally involved in education is compelled to presume the existence of two forms of instruction which are strictly separable: traditional face-to-face teaching based on interpersonal communication and industrialized teaching, which is based on objectivized, rationalized technologically-produced interaction. (in Keegan, 1986, p. 80)

In his landmark work, *The Foundations of Distance Education*, Keegan classified theories of distance education into three groups:

- theories of independence and autonomy,
- theory of industrialization of teaching, and
- theories of interaction and communication.

A fourth category seeks an explanation of distance education in a synthesis of existing theories of communication and diffusion, as well as philosophies of education.

Theory of Independent Study–Charles Wedemeyer

For Wedemeyer, the essence of distance education was the independence of the student. This was reflected in his preference for the term "independent study" for distance education at the college or university level. Wedemeyer was critical of contemporary patterns of higher education, believed that outdated concepts of learning and teaching were being employed, and that they failed to utilize modern technologies in ways that could alter the institution (Keegan, 1986).

Wedemeyer set forth a system with ten characteristics emphasizing learner independence and adoption of technology as a way to implement that independence. According to Wedemeyer, the system should:

- be capable of operation any place where there are students–or even only one student–whether or not there are teachers at the same place at the same time;

- place greater responsibility for learning on the student;

- free faculty members from custodial-type duties so that more time can be given to truly educational tasks;

- offer students and adults wider choices (more opportunities) in courses, formats, methodologies;

- use, as appropriate, all the teaching media and methods that have been proved effective;

- mix and combine media and methods so that each subject or unit within a subject is taught in the best way known;

- cause the redesign and development of courses to fit into an "articulated media program;"

- preserve and enhance opportunities for adaptation to individual differences;

- evaluate student achievement simply, not by raising barriers concerned with the place, rate, method, or sequence of student study; and

- permit students to start, stop and learn at their own pace. (In Keegan, 1986, p. 63)

Wedemeyer proposed the separation of teaching from learning as a way of breaking education's "space-time barriers." He suggested six characteristics of independent study systems:

- The student and teacher are separated.

- The normal processes of teaching and learning are carried out in writing or through some other medium.

- Teaching is individualized.

- Learning takes place through the student's activity.

- Learning is made convenient for the student in his own environment.

- The learner takes responsibility for the pace of his or her own progress, with freedom to start and stop at any time. (in Keegan, 1986, p. 64)

Wedemeyer noted four elements of every teaching-learning situation: a teacher, a learner or learners, a communications system or mode, and something to be taught or learned. He proposed a reorganization of these elements that would accommodate physical space and allow greater learner freedom. Key to the success of distance education, Wedemeyer believed, was the development of the relationship between student and teacher.

Theory of Independent Study–Michael Moore

Formulated in the early 1970s, Moore's theory of distance education, which he calls "independent study," is a classification method for distance education programs. Shaped in part by Moore's adult education and university extension experience, it examines two variables in educational programs: the amount of learner autonomy and the distance between teacher and learner.

For Moore, distance is composed of two elements, each of which can be measured. First is the provision for two-way communication (dialog). Some systems or programs offer greater amounts of two-way communication than others. Second is the extent to which a program is responsive to the needs of the individual learner (structure). Some programs are very structured, while others are very responsive to the needs and goals of the individual student.
In the second part of his theory, Moore addresses learner autonomy. He notes that in traditional school settings learners are very dependent on teachers for guidance, and that in most programs, conventional and distance, the teacher is active, while the student is passive.

In distance education, there is a gap between teacher and student, so the student must "accept a high degree of responsibility for the conduct of the learning program" (Keegan, 1986, p. 74). The autonomous learner needs little help from the teacher, who may be more of a respondent than a director. Some adult learners, however, require "help in formulating their learning objectives and in identifying sources of information and in measuring objectives" (Keegan, 1986, p. 74).

Moore classifies distance education programs as "autonomous" (learner-determined) or "non-autonomous" (teacher-determined), and gauges the degree of autonomy accorded the learner by answering the following three questions:

- Is the selection of learning objectives in the program the responsibility of the learner or of the teacher (autonomy in setting of objectives)?

- Is the selection and use of resource persons, of bodies and other media, the decision of the teacher or the learner (autonomy in methods of study)?

- Are the decisions about the method of evaluation and criteria to be used made by the learner or the teacher (autonomy in evaluation)? (Keegan, 1986, p. 75)

Theory of Industrialization of Teaching–Otto Peters

In a major treatise on education, Otto Peters of Germany developed a view of distance education as an industrialized form of teaching and learning. He examined a research base formed in his work that included an extensive analysis of the distance teaching organizations of the 1960s. This led him to propose that distance education could be analyzed by comparison with the industrial production of goods. He stated that "from many points of view conventional, oral, group-based education is a pre-industrial form of education" (in Keegan, 1986, p. 81). His statement implied that distance teaching could not have existed before the industrial era. Based on economic and industrial theory, Peters (1988), proposed the following new categories (terminology) for the analysis of distance education.

- Rationalization: the use of methodical measures to reduce the required amount of input of power, time and money. In distance education, "ways of thinking, attitudes and procedures can be found which only established themselves in the wake of an increased rationalization in the industrialization of production processes" (p. 98).

- Division of labor: division of a task into simpler components or subtasks. In distance education, the conveying of information, counseling, assessment and recording of performance, are performed by separate individuals. To Peters, "the division of labor is the main prerequisite for the advantages of [distance education] to become effective" (p. 100).

- Mechanization: the use of machines in a work process. Distance education, Peters notes, would be impossible without machines. "Duplicating machines and transport systems are prerequisites, and later forms of distance teaching have the additional facilities of modern means of communication and electronic data processing installations" (p. 101).

- Assembly line: commonly, a method of work in which workers remain stationary, while objects they are working on move past them. In traditional distance education programs, materials for both teacher and student are not the product of an individual. Rather, instructional materials are designed, printed, stored, distributed and graded by specialists.

- Mass production: the production of goods in large quantities. Peters noted that, because demand outstrips supply at colleges and universities, there has been a trend toward large-scale operations not entirely consistent with traditional forms of academic teaching. Mass production of distance education courses, however, can enhance quality. Peters believed that "the large number of courses produced forces distance teaching organizations to analyze the requirements of potential distance learners far more carefully than in conventional teaching and to improve the quality of the courses" (p. 103).

- Preparatory work: determining "how workers, machines and materials can usefully relate to each other during each phase of the production process." Peters believed that the success of distance education "depends decisively on a "preparatory phase." It concerns the development of the distance study course involving experts in the various specialist fields with qualifications also often higher than those of other teachers involved in distance study" (p. 104).

- Planning: the "system of decisions which determines an operation prior to it being carried out." Peters notes that planning is important in the development phase of distance education, "as the contents of correspondence units, from the first to the last, must be determined in detail, adjusted in relation to each other and represented in a predetermined number of correspondence units. The importance of planning is even greater when residential study is a component of a distance education program" (p. 104).

- Organization: "creating general or permanent arrangements for purpose-oriented activity." Peters notes the relationship between rational organization and effectiveness of the teaching method. "Organization makes it possible for students to receive exactly predetermined documents at appointed times, for an appropriate university teacher to be immediately available for each assignment sent in, [and] for consultations to take place at fixed locations at fixed times" (p. 105). Organization, Peters points out, is optimized in large distance education programs.

- Scientific control methods: by which "work processes are analyzed systematically, particularly by time studies, and in accordance with the results obtained from measurements and empirical data the work processes are tested and controlled in their elementary details in a planned way, in order to increase productivity, all the time making the best possible use of working time and the staff available" (p. 106). In distance education, some institu-

BEST COPY AVAILABLE

tions hire experts to apply techniques of scientific analysis to the evaluation of courses.

- Formalization: the predetermination of the phases of the manufacturing process. In distance education, "all the points in the cycle, from student to distance teaching establishment to the academics allocated, must be determined exactly" (p. 106).

- Standardization: the limitations of manufacture to a restricted "number of types of one product, in order to make these more suitable for their purpose, cheaper to produce and easier to replace." In distance education, "not only is the format of the correspondence units standardized, [so is] the stationery for written communication between student and lecturer, and the organizational support, as well as each single phase of the teaching process, but also the academic contents" (p. 107).

- Change of function: the change of the role or job of the worker in the production process. In distance education, change of function is evident in the role of the lecturer. "The original role of provider of knowledge in the form of the lecturer is split into that of study unit author and that of marker; the role of counselor is allocated to a particular person or position. Frequently, the original role of lecturer is reduced to that of a consultant whose involvement in distance teaching manifests itself in periodically recurrent contributions" (p. 108).

- Objectification: the loss, in the production process, of the "subjective element which used to determine craft[s]men's work to a considerable degree" (p. 108). In distance education, "most teaching functions are objectified as they are determined by the distance study course as well as technical means. Only in written communication with the distance learner or possibly in a consultation or the brief additional face-to-face events on campus has the teacher some individual scope left for subjectively determined variants in…teaching method" (p. 109).

- Concentration and centralization: because of the large amounts of capital required for mass production and the division of labor, there has been a trend to "large industrial concerns with a concentration of capital, a frequently centralized administration, and a market that is not seldom monopolized" (p. 109). Peters noted the trend toward distance education institutions serving very large numbers of students. The Open University of the United Kingdom, for instance, had more than 70,000 students in 1988. It is more economical to establish a small number of such institutions serving a national population, rather than a larger number of institutions serving regional populations.

Peters concluded that for distance teaching to become effective, "the principle of the division of labor is thus a constituent element of distance teaching" (p. 100). The teaching process in his theory of industrialization is gradually restructured through increasing mechanization and automation. He stated that:

- The development of distance study courses is just as important as the preparatory work taking place prior to the production process.

- The effectiveness of the teaching process is particularly dependent on planning and organization.

- Courses must be formalized and expectations from students standardized.

- The teaching process is largely objectified.

- The function of academics teaching at a distance has changed considerably vis-à-vis university teachers in conventional teaching.

- Distance study can only be economical with a concentration of the available resources and a centralized administration. (p. 110)

According to Peters, "within the complex overall distance teaching activity one area has been exposed to investigation that had been regularly omitted from traditional didactic analysis" (p. 111). New concepts were used to describe new facts that merit attention. He did not deny there were disadvantages to a theory of the industrialization of teaching but in any exploration of teaching, a recognition of the industrial structures characteristic of distance teaching need to be taken into account in decision-making.

Theory of Interaction and Communication–Börje Holmberg

Holmberg's theory of distance education, what he calls "guided didactic conversation," falls into the general category of communication theory. Holmberg notes that his theory "seems to have explanatory value in relating teaching effectiveness to the impact of feelings of belonging and cooperation as well as to the actual exchange of questions, answers and arguments in mediated communication" (1986, p. 123).

Holmberg (1986) offers seven "background assumptions" for his theory:

- The core of teaching is interaction between the teaching and learning parties; it is assumed that simulated interaction through subject-matter presentation in pre-produced courses can take over part of the interaction by causing students to consider different views, approaches and solutions and generally interact with a course.

- Emotional involvement in the study and feelings of personal relation between the teaching and learning parties are likely to contribute to learning pleasure.

- Learning pleasure supports student motivation.

- Participation in decision-making concerning the study is favorable to student motivation.

- Strong student motivation facilitates learning.

- A friendly, personal tone and easy access to the subject matter contribute to learning pleasure, support student motivation and thus facilitate learning from the presentations of pre-produced courses, i.e., from teaching in the form of one-way traffic simulating interaction, as well as from didactic communication in the form of two-way traffic between the teaching and learning parties.

- The effectiveness of teaching is demonstrated by students' learning of what has been taught. (p.123)

These assumptions, Holmberg believes, are the basis of the "essential teaching principles of distance education." From these assumptions he formed his normative teaching theory:

> Distance teaching will support student motivation, promote learning pleasure and make the study relevant to the individual learner and his/her needs, creating feelings of rapport between the learner and the distance-education institution (its tutors, counselors, etc.), facilitating access to course content, engaging the learner in activities, discussions and decisions and generally catering for helpful real and simulated communication to and from the learner. (p. 123)

Holmberg himself notes that this is "admittedly a leaky theory" (1986, p. 125). However, he adds, "it is not devoid of explanatory power: it does, in fact, indicate essential characteristics of effective distance education."

In 1995 Holmberg significantly broadened his theory of distance education. This new comprehensive theory of distance education is divided into eight parts. Part six of this expanded theory encompasses the theory just stated above.

- Distance education serves individual leaners who cannot or do not want to make use of face-to-face teaching. These learners are very heterogeneous.

Distance education can make learners independent of decisions made by others as to place of study, division of the year into study terms and vacations, timetables, and entry requirements.

Distance education thus promotes students' freedom of choice and independence.

- Society benefits from distance-education provision of on the one hand liberal study opportunities for individual learners, on the other hand of professional/occupational training.

Distance education is an instrument for recurrent and lifelong learning for free access to learning opportunities and equity.

- All learning concerned with the acquisition of cognitive knowledge and cognitive skills as well as affective learning and some psychomotor learning are effectively provided for by distance education. Distance education may inspire metacognitive approaches.

- Distance education is based on deep learning as an individual activity. Learning is guided and supported by noncontiguous means. Teaching and learning rely on mediated communication, usually based on pre-produced courses.

- Distance education is open to behaviourist, cognitive, constructivist and other modes of learning. It has, on the one hand, an element of industrialisation with division of labour, use of mechanical devices, electronic data processing and mass communication, usually based on pre-produced courses.

- Personal relations, study pleasure and empathy between students and those supporting them (tutors, counselors etc.) are central to learning in distance education. Feelings of empathy and belonging promote students' motivation to learn and influence the learning favourable. Such feelings are conveyed by students being engaged in decision making, by lucid, problem-oriented conversation-like presentations of learning matter that may be anchored in existing knowledge, by friendly, noncontiguous interaction between students and tutors, counselors and others supporting them, and by liberal organisational-administrative structures and processes.

- While it is an effective mode of training distance education runs the risk of leading to mere fact learning and reproduction of accepted 'truths'. However, it can be organised and carried out in such a way that students are encouraged to search, criticize and identify positions of their own. It thus serves conceptual learning, problem learning, and genuinely academic ends.

BEST COPY AVAILABLE

- In sum: the above represents on the one hand a description of distance education, on the other hand a theory from which hypothesis are generated and which has explanatory power in that it identifies a general approach favourable to learning and to the teaching efforts conducive to learning (Holberg, 1995a, pp. 7-8).

A Synthesis of Existing Theories–Hilary Perraton

Perraton's (1988) theory of distance education is composed of elements from existing theories of communication and diffusion, as well as philosophies of education. It is expressed in the form of 14 statements, or hypotheses. The first five of these statements concern the way distance teaching can be used to maximize education:

- "You can use any medium to teach anything" (p. 37).
- "Distance teaching can break the integuments of fixed staffing ratios which limited the expansion of education when teacher and student had to be in the same place at the same time" (p. 37).
- "There are circumstances under which distance teaching can be cheaper than orthodox education, whether measured in terms of audience reached or of learning" (p. 37).
- "The economies achievable by distance education are functions of the level of education, size of audience, choice of media and sophistication of production" (p. 38).
- "Distance teaching can reach audiences who would not be reached by ordinary means" (p. 38).

The following four statements address the need to increase dialogue:

- "It is possible to organize distance teaching in such a way that there is dialogue" (p. 39).
- "Where a tutor meets distance students face-to-face, the tutor's role is changed from being a communicator of information to that of a facilitator of learning" (p. 40).
- "Group discussion is an effective method of learning when distance teaching is used to bring relevant information to the group" (p. 40).
- "In most communities there are resources which can be used to support distance learning to its educational and economic advantage" (p. 41).

The final five statements deal with method:

- "A multimedia program is likely to be more effective than one which relies on a single medium" (p. 41).
- "A systems approach is helpful in planning distance education" (p. 41).
- "Feedback is a necessary part of a distance-learning system" (p. 41).
- "To be effective, distance-teaching materials should ensure that students undertake frequent and regular activities over and above reading, watching or listening" (p. 42).
- "In choosing between media, the key decision on which the rest depend concerns the use of face-to-face learning" (p. 42).

An Emerging Theory

The impact of new technologies on distance education are far-ranging. Desmond Keegan (1995) suggests that "electronically linking instructor and students at various locations" creates a virtual classroom (p. 3). He goes on to state that:

> The theoretical analyses of virtual education, however, have not year been addressed by the literature: Is it a subset of distance education or to be regarded as a separate field of educational endeavour? What are its didactic structures? What is the relationship of its cost effectiveness and of its educational effectiveness to distance education and to conventional education. (p. 18)

It is in this emerging environment of virtual education that Simonson and Schlosser (1995) suggest a new theory of distance education. They theorize that for distance education to be successful:

> Its appropriate application should be based on the belief that the more similar the learning experience of the distant student is to that of the local student, the more similar will be the outcomes of the learning experience. (p. 13)

This theory is based on their definition of distance education as formal institutionally based education that takes place at the same time but in a different place using two-way interactive telecommunication systems. Simonson (1996) in elaborating on this theory states:

> It should not be necessary for any group of learners to compensate for different, possibly lesser, instruc-

> tional experiences. Thus, those developing distance educational systems should strive to make equivalent the learning experiences of all students no matter how they are linked to the resources or instruction they require. (p. 6)

This approach is supported by Shale (1988) who argued that distance education is not a distinct field of education. He states that the process of education when students and teacher are face to face is the same as when students and teachers are at a distance.

> This new approach to distance education based on virtual classrooms requires a substantially different theory upon which to base practice than the traditional view of distance education as it has been practiced in the past. The study of virtual and electronic classrooms is an important and complex field, still in its beginnings, with a unique contribution to make to educational knowledge. (Keegan, 1995, p. 19)

A Theoretical Framework for Distance Education–Desmond Keegan

Keegan (1986) suggested that the theoretician had to answer three questions before developing a theory of distance education:

- *Is distance education an educational activity?* Keegan's answer was that, while distance education institutions possess some of the characteristics of businesses, rather than of traditional schools, their educational activities are dominant. Distance education is a more industrialized form of education. The theoretical bases for distance education, Keegan pointed out, were within general education theory.

- *Is distance education a form of conventional education?* Keegan believed that, because distance education is not based on interpersonal communication and is characterized by a privatization of institutionalized learning (as is conventional education), it is a distinct form of education. Therefore, while the theoretical basis for distance education could be found within general education theory, it could not be found "within the theoretical structures of oral, group-based education" (p. 116).

However, Keegan (1995) considers virtual systems based on teaching face-to-face at a distance, "a new cognate field of study" to distance education. He believes that a "theoretical analyses of virtual education still needs to be addressed" (p. 18).

- *Is distance education possible? Is it a contradiction in terms?* Keegan points out that if education requires intersubjectivity—"a shared experience in which teacher and learner are united by a common zeal"—then distance education is a contradiction in terms. Distance instruction is possible, but distance education is not. (p. 118)

Again, the advent of virtual systems used in distance education challenge the traditional answer to this question (Keegan, 1995).

Central to Keegan's concept of distance education is the separation of the teaching acts in time and place from the learning acts. Successful distance education, he believes, requires the reintegration of the two acts:

> The intersubjectivity of teacher and learner, in which learning from teaching occurs has to be artificially recreated. Over space and time, a distance system seeks to reconstruct the moment in which the teaching-learning interaction occurs. The linking of learning materials to learning is central to this process. (p. 120)

Reintegration of the act of teaching at a distance is attempted in two ways. First, "learning materials, both print and non-print, are designed to achieve as many of the characteristics of interpersonal communication as possible" (p. 122). Second, when courses are presented, reintegration of the teaching act is attempted by a variety of techniques, including: "communication by correspondence, telephone tutorial, on-line computer communication, comments on assignments by tutors or computers, teleconferences, etc." (p. 122).

The process of reintegrating the act of teaching in distance education, Keegan suggests, results in at least five changes to the normal structure of oral, group-based education:

- the industrialization of teaching,
- the privatization of institutional learning,
- change of administrative structure,
- different plant and buildings, and
- change of costing structures. (p. 125)

Keegan offers three hypotheses drawn from his theoretical framework:

- Distance students have a tendency to drop out in those institutions in which structures for the reintegration of the teaching acts are not satisfactorily achieved.

- Distance students have difficulty in achieving quality of learning in those institutions in which structures for the reintegration of the teaching acts are not satisfactorily achieved.

- The status of learning at a distance may be questioned in those institutions in which the reintegration of the teaching acts are not satisfactorily achieved. (p. 126)

Fordism, Neo-Fordism, Post-Fordism: A Theoretical Debate

In recent years Peter's view of distance education has received renewed attention. His theory of industrialized education is "a point of departure", and is extended and revised based on "contemporary industrial transformation" in a debate on the future of distance education (Renner, 1995, p. 284). Fordism and post-Fordism are the terms borrowed from industrial sociology to classify the opposing views of the debate. This debate deals with changes in the practice of distance education and represents "wider debates about the nature of change in the contemporary period" (Edwards, 1995, p. 242). While not all would agree that the Fordist framework applies to distance education (Rumble, 1995a, 1995b, 1995c), it as become "the mainstream theory of distance education in international literature" and provides a useful analogy in debating the practice of distance education (Ding, 1995, p. 217).

The term Fordism is derived from Henry Ford's approach to the mass production for mass consumption of automobiles early in this century (Renner, 1995). Fordism, neo-Fordism, and post-Fordism are terms that represent three ways to conceptualize the production of distance education production. "Each of these ideal-type models suggest very different social, political and educational outcomes" (Renner, 1995. p. 284). Badham and Matthews (1989) provide a clear model for understanding the three categories of distance education production.

They proposed that a firm's production process and its production strategy can be defined in terms of these three variables–product variety, process innovation, and labour responsibility–and they suggested that a production paradigm represents an exemplary model of efficient production which guides organizational strategy (Campion, 1995, p. 194).

In looking at the three variables–product variety, process innovation, and labour responsibility–Fordism would be described as having low product innovation, low process variability, and low labour responsibility. Neo-Fordism would have high product innovation, high process variability, but would maintain the low labour responsibility of the Fordism definition. High product innovation, high process variability and high labor responsibility would typify the post-Fordism model (Badham & Mathers, 1989).

Campion (1995) illustrated how these three different production processes relate to distance education:

> **The Fordist strategy** for distance education suggested a fully-centralised, single-mode, national distance education provider, gaining greater economies of scale by offering courses to a mass market, thereby justifying a greater investment in more expensive course materials. Rationalisation of this kind allows for increased administrative control and a more extreme division of labour as the production process is fragmented in an increasing number of component tasks.
>
> **The neo-Fordist strategy** extends the Fordist system by allowing much higher levels of flexibility and diversity, and by combining low volumes with high levels of product and process innovation. However, neo-Fordist production retains a highly-centralised Fordist approach to labour organisation and control. A neo-Fordist expression of distance education might well be represented by a centrally-controlled, perhaps multinational, yet locally-administered model of distance education. By also using self-instructional course materials for teaching on-campus students, it has the potential to massively reduce costs across the whole student population. However, and most importantly, a neo-Fordist manifestation of distance education bears a strong relationship to that of the Fordist route insomuch as it has an overall deskilling effect on academic staff.
>
> **The post-Fordist strategy** is characterised by high levels of all three variables: product innovation, process variability, and labour responsibility. It is opposed to neo-Fordism and to Fordism, dispensing with a Taylorist division of labour and rigid managerial control and deliberately fostering a skilled and responsible workforce. A post-Fordist model of distance education would be decentralised and retain integration between the study modes. Academic staff would, however, retain autonomous control of their administered courses, and in so doing, would be able rapidly to adjust course curriculum and delivery to the changing needs of students. (Based on Campion & Renner, 1992, pp. 10–11 in Campion, 1995, p. 194)

In general, Fordist distance education involves mass production for mass consumption (Ding, 1995; Campion, 1995). There is centralized control, a division of work tasks associated with distance education and the creation of management processed for the division of the work tasks (Campion, 1995). Courses are developed by a small core of skilled workers and delivered centrally with a "deskilling" effect on the teacher (Ding, 1995; Campion, 1992, 1995).

In a neo-Fordist system course development, delivery and administration is mixed between a centralized office and regional or local offices. This allows for more flexibility in course development and delivery. In the neo-Fordist model the teacher is still given little responsibility beyond delivering the developed materials (Ding, 1995). The post-Fordist approach to distance education would focus on the consumer rather than the product. Administration would be decentralized, democratic and participatory with its division of labor informal and flexible. Teachers would have a high responsibility to develop curriculum and respond to the learning needs of their students (Campion, 1995; Edwards, 1995).

Much of education as it developed over the past century fits the Fordist paradigm. Renner (1995) states that education became "a formalised system of production which could be monitored, maintained, and controlled in the same way as the factory" (p. 286). The practice of distance education has also been greatly influenced by the Fordist paradigm. Campion and others argue that it is still the dominant paradigm in distance education (Campion, 1990; Ding, 1995).

Distance education has been influenced by the Fordist paradigm because it is the model that has been most successful in business throughout this century. Evans (1995) states that "distance education can be seen as both a product and a process of modernity. Its administrative systems, distribution networks and print production processes are characteristic of modern societies with developed mass production, consumption and management" (p. 256). The Fordism approach to distance education provides cost efficiencies and quality production of materials unachievable outside of the Fordist model (Campion, 1990). In addition, global competition in distance education "will favour the marketing power of large educational providers" (Renner, 1995, p. 290). The Fordism approach to the practice of distance education provides obvious advantages.

However, major concerns about the continuation of the Fordist paradigm in distance education have been expressed. These concerns center around the following themes:

1. Mass markets for delivered instruction have changed reducing the demand for centrally produced instruction for mass delivery.

2. The Fordism model is unable to adapt to the needs of a fast-changing society.

3. The focus on instructional production and "systematic use of pre-programmed curricula is incompatible with higher levels of educational quality" (Renner, 1995, p. 285).

With "heightened competition, diversification of demand and rapid developments in communication and information technology the Fordist rationale which presumes a uniform mass-market to support mass-production is inappropriate" (Renner, 1995, pp. 290–291). As a result, the cost effectiveness and cost efficiency of centrally developed and delivered instruction has declined. Ding (1995) in reporting on China's distance education system indicates that the market for many of the traditional disciplines are close to saturation while there are many demands for "specific disciplines and specialities". However, Ding states that there is a "relatively small demand in each specialty, such as English for foreign trade, tourist economics, manufacture of household appliances and so on" (p. 230). In addition different regions of the country report differing needs (Ding, 1995). Renner (1995) concludes that "open education markets are becoming more fragmented, competitive and specialised" (1995, p. 291; Campion, 1992). A search for more efficient and flexible forms of organisational structure are an inescapable outcome.

The Fordist structure is not well-suited to easily adapt to the changing needs in society. "If we combine an increasingly differentiated consumer market with the power and speed of contemporary interactive computer communications technologies and add to this a more highly educated workforce, then the bureaucratic practices of the past would seem far from sustainable" (Campion, 1995, p. 208). This new environment requires a flexible structure in which ideas are readily tried and shared (Campion, 1992). In China, Ding (1995) found that the Fordist structure could not "change and adapt itself to the new conditions of the market immediately and quickly" (p. 231). He stated that the Fordist structure could not adapt curricula to the regional needs of the country or alter the structure and content of the course to the needs of the students. The answer according to Renner (1995) is to place an "emphasis on labour flexibility" that would "allow individual academics to produce and deliver quality curriculum more readily customised to student needs" (p. 289). It is felt that post-Fordist systems of distance education would be able to rapidly respond to the needs of society (Campion, 1995; Edwards, 1995; Renner, 1995).

Renner's statement that "systematic use of pre-programmed curricula is incompatible with higher levels of educational quality" suggests a controversy that goes beyond the debate on Fordism (1995, p. 285). Pre-programmed curricula used in the Fordist approach to distance education are products of instructional design based in behaviorism (Campion, 1992). Post-Fordism is directly linked to constructivism. Renner (1995) states that "the relationship between constructivism and post-Fordism is intimate" (p. 296). The constructivist believes that the individual gives meaning to the world through experience. "Ideally, it is a process of personal and cooperative experimentation, questioning and problem solving through

BEST COPY AVAILABLE

which meaning can be constructed" (Renner, 1995, p. 295). This approach to learning is viewed as incompatible with mass production of instructional curricula developed with instructional design methods based in behaviorism that assume a more passive approach to learning. For constructivist learning to occur, teaching must remain "flexible and sensitive to learner needs, from intellectual, cognitive and psychological perspectives" (Nunan, 1983, in Renner, 1995). "Centrally-devised educational courseware which dictates teaching sequences to students and deskilled tutor-grade staff discourage the customisation and construction of knowledge" (Renner, 1995, p. 297).

The preceding paragraphs outline the differences between Fordism and post-Fordism. Where does neo-Fordism fit into the debate? For the advocates of post-Fordism, neo-Fordism is no more acceptable than Fordism. While there is higher product innovation and process variability, labor responsibility is still low. It is in this view of the role of labor that divides the new-Fordist approach from the post-Fordist approach. The neo-Fordism "division of labour leaves teacher-grade academic staff divorced from research, curriculum development and scholarly inquiry" (Renner, 1995, p. 293). They simply deliver the curriculum prepared for them. Proponents of the post-Fordist paradigm have two disagreements with this approach. First, this approach again assumes a behavioral based instructional design method to curricula development. The preceding paragraph outlined the post-Fordist's concerns about this approach. Secondly, post-Fordists would see this approach as being exploitative of the worker. High product innovation and process variability puts additional demands on the worker without additional compensation. The neo-Fordism and post-Fordism approaches to distance education are fundamentally different (Campion, 1995; Renner, 1995).

As can be seen from the preceding paragraphs, "the debate about Fordism is intricate, heated, and tied in with differing political, economic, aesthetic, ethical, and educational perspectives" (Campion, 1992). The issues raised in this debate are important because "policy-makers introduce policies, generate institutional structures and effectively organize workplace practices on the basis of such paradigms. How students learn, and frequently what they learn are products of these decisions." As the role of distance education is defined in a changing society, these issues need to be given careful consideration (Campion, 1995, p. 195).

There is little involvement in the Fordism/post-Fordism debate by American distance educators. In the United States "local control, small classes, rapport between teachers and students, and highly personalized instruction are hailed as important characteristics" of its highly respected educational system (Simonson, 1995d, p. 3). This approach to education is diametrically opposed to the mass production, centralized control advocated by a Fordist approach to distance education. While Thach and Murphy (1994) suggest that there is a need for national coordination of higher distance education and that local and state control of education inhibit opportunities for collaboration at a distance among institutions, the United State's traditional approach to education is prevalent. This focus on student needs, personalized instruction and interaction is evident in the following statement by Michael Moore (1994).

> In a typical United States course that uses teleconferencing technologies to link, let us say, six sites, the curriculum problem is how to integrate the local interests and needs, as well as the local knowledge that lies at each site, into the content to be taught. (p. 2)

Summary

In the rapidly changing and diverse environment in which distance education is practiced, many questions remain unanswered. In this environment it is difficult to arrive at one definition or agree on a theory of how to practice and research in the field of distance education. New technologies, globalization and new ideas about student learning challenge the traditional approaches to the practice of distance education. This theme of change is evident in the discussions of distance education and its definition, history, status, and theory.

Numerous definitions for distance education have been proposed, most include the separation of teacher and learner, the influence of an educational organization, the use of media to unite teacher and learner, the opportunity for two-way communication, and the practice of individual learning (Keegan, 1990, in Holmberg, 1995). The traditional definitions describe distance education as taking place at a different time and in a different place while recent definitions, enabled by new interactive technologies, stress education that takes place at a the same time but in a different place. The role of educational organizations in the distance education process has also been challenged. For example, open learning is a form of distance education which occurs without the influence of an educational organization. These issues will continue to be debated as distance educators seek definitions that fit a changing world.

Investigating the relatively brief history of distance education reveals both a diversity and an ongoing change in its practice. Historically, diverse practices of distance education have been developed according to the resources and philosophies of the organizations providing instruction. The history also shows, that key changes in distance education have been promoted by advances in technology. These changes have been most evident in the rapid development of electronic communications in recent decades.

How the future of distance education will be shaped by the integration of its history and these new technologies is yet to be seen.

Changes in society, politics, economics, and technology are impacting the status of distance education around the world. In some cases, distance education is seen as an answer to inadequate educational opportunities caused by political and/or economic instability. In other situations, established distance education providers are being required by a changing society to convert from mass instruction to a more decentralized approach to meet diverse needs of their students. In many countries, the need for continuing education or training and access to degree programs is accelerated by the demands of a changing society. Students in rural or isolated parts of the world look to distance education for opportunities to "keep up" with the outside world. Again, technology advances are a major influence for change in distance education worldwide. The globalization of the world enabled by these new technologies will challenge distance educators to rethink the practice of distance education to take advantage of these new opportunities.

The changing and diverse environment in which distance education is practiced has inhibited the development of a single theory upon which to base practice and research. A variety of theories have been proposed to describe traditional distance education. They include theories that emphasize independence and autonomy of the learner, industrialization of teaching and interaction and communication. These traditional theories emphasize that distance education is a fundamentally different form of education. Recent emerging theories, based on the capabilities of new interactive audio and video systems, state that distance education is not a distinct field of education. Both utilization of existing educational theory and the creation of like experiences for both the distant and local learner are emphasized. Traditional distance education theorists will need to address the changes to distance education facilitated by new technologies. Advocates of the new theories will need to consider their impact on the traditional strengths of distance education. Specifically, the new theories' focus on face to face instruction eliminates the advantage of time independent learning that traditional theories of distance education value. The debate of these theoretical issues will only increase in the face of continued change.

One indication of the impact of change in distance education theory is the Fordist/post-Fordist debate. Fordist distance education is administered centrally and involves mass production of curricula for mass consumption. Rapid changes in society have resulted in diverse market needs. The Fordist paradigm is unable to respond quickly to these needs. The post-Fordists paradigm implements a decentralized, democratic administration that focuses on the consumer. In this paradigm, teachers have a high responsibility to respond to individual needs of students. Central to the debate between Fordists and post-Fordists are changing views about how learning occurs. The Fordist approach is based in behaviorism learning theory in which knowledge is delivered to the learner. The constructivist approach to learning in which individuals give meaning to the world through experience underlies the post-Fordist position. The debate of these differences will continue as distance education adapts to meet the needs of a changing society.

An environment in which technology, society, economics, politics, and theories of learning are all in transition, suggests that definitions, theories and the practice of distance education will continue to be contested. This theme of change will both challenge and motivate distance educators and researchers as they strive to understand and develop effective ways to meet the needs of learners around the world.

References

Ackermann, E. (1995). Learning to use the Internet. Wilsonville, Oregon: Franklin, Beedle and Associates Inc.

Albright, M. (1988). A conceptual framework for the design and delivery of a university-level credit course by communications satellite. Unpublished doctoral dissertation. Iowa State University, Ames.

Badham, R. & Mathews, J. (1989). The new production systems debate. Labour and Industry, 2(2), 194–246.

Barry, M. & Runyan, G.B. (1995). A review of distance-learning studies in the U. S. military. The American Journal of Distance Education, 9(3), 37–47.

Bruder, I. (1989). Distance learning: What's holding back this boundless delivery system? Electronic Learning, 8(6), 30–35.

Buckland, M., & Dye, C. M. (1991). The development of electronic distance education delivery systems in the United States. Recurring and emerging themes in history and philosophy of education. (ERIC Document Reproduction Service No. 345 713)

Campion, M. & Renner, W. (1992) . The supposed demise of fordism–Implications for distance and higher education. Distance Education, 13(1), 7–28.

Campion, M. (1995). The supposed demise of bureaucracy: Implications for distance education and open learning–more on the post-Fordism debate. Distance Education, 16(2), 192–216.

BEST COPY AVAILABLE

Cropley, A. J., & Kahl, T. N. (1983). Distance education and distance learning: Some psychological considerations. Distance Education, 4(1), 27–39.

Ding, X. (1994). China's higher distance education–Its four systems and their structural characteristics at three levels. Distance Education, 15(2), 327–346.

Ding, X. (1995). From Fordism to new-Fordism: industrialisation theory and distance education–a Chinese perspective. Distance Education, 16(2), 217–240.

Edwards, R. (1995). Different discourses, discourses of difference: Globalisation, distance education, and open learning. Distance Education, 16(2), 241–255.

Evans, T. (1995). Globalisation, post-Fordism and open and distance education. Distance Education, 16(2), 256–269.

Garrison, D. R., & Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. The American Journal of Distance Education, 1(1), 7–13.

Holmberg, B. (1985). The feasibility of a theory of teaching for distance education and a proposed theory (ZIFF Papiere 60). Hagen (West Germany): Fern Universität, Zentrales Institute fur Fernstudienforschung Arbeitsbereich. (ERIC Document Reproduction Service No. ED 290 013)

Holmberg, B. (1986). Growth and structure of distance education. London: Croom Helm.

Holmberg, B. (1989). Theory and practice of distance education. London: Routledge.

Holmberg, B. (1995a). The sphere of distance-education theory revisited. (ERIC Document Reproduction Service No. ED 386 578)

Holmberg, B. (1995b). The evolution of the character and practice of distance education. Open Learning, 10(2), 47–53.

Johnson, J. K. (1988). Attitudes of high school students in small rural schools toward interactive satellite instruction. Unpublished master's thesis, Iowa State University, Ames.

Keegan, D. (1986). The foundations of distance education. London: Croom Helm.

Keegan, D. (1988a). On defining distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 6–33). New York: Routledge.

Keegan, D. (1988b). Theories of distance education: Introduction. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives, (pp. 63–67). New York: Routledge.

Keegan, D. (1994). Distance training in the European union (ZIFF Papiere). Hagen, Germany: Institute for Research into Distance Education, Fern Universitat. (ERIC Document Reproduction Service No. ED 381 684)

Keegan, D. (1995). Distance education technology for the new millennium: Compressed video teaching. (ERIC Document Reproduction Service No. ED 389 931).

Lintz, M. & Tognotti, S. (1996). Distance education on the WWW. [World Wide Web], Available: http://tecfa.unige.ch/edu-ws94/contrib/peraya.fm.html

Magnus, J. (1996). Distance education in sub-Saharan Africa: The next five years. Innovations in Education and Training International, 33(1), 50–56.

Moore, M. (1994). Autonomy and interdependence. The American Journal of Distance Education, 8(2), 1–5.

Perraton, H. (1988). A theory for distance education. In D. Sewart, D. Keegan, & B. Holmberg (Ed.), Distance education: International perspectives (pp. 34–45). New York: Routledge.

Peters, O. (1988). Distance teaching and industrial production: A comparative interpretation in outline. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 95–113). New York: Routledge.

Renner, W. (1995). Post-Fordist visions and technological solutions: Education technology and the labour process. Distance Education, 16(2), 285–301.

Riel, M. & Harasim, L. (1994). Research perspectives on network learning. Machine-Mediated Learning, 4(2-3), 91–113.

Rose, S. N. (1991). Collegiate-based noncredit courses. In B. B. Watkins & S. J. Wright (Eds.), The foundations of American distance education (pp. 67–92). Dubuque, IA: Kendall/Hunt.

Rumble, G. (1989). On defining distance education. The American Journal of Distance Education, 3(2), 8–21.

Rumble, G. (1995a). Labour market theories and distance education I: Industrialisation and distance education. Open Learning, 10(1), 10–21.

Rumble, G. (1995b). Labour market theories and distance education II: How Fordist is distance education? Open Learning, 10(2), 12–28.

Rumble G. (1995c). Labour market theories and distance education III: Post-Fordism the way forward? Open Learning, 10(3).

Shale, D. (1988). Toward a reconceptualization of distance education. The American Journal of Distance Education, 2(3), 25–35.

Simonson, M. (1995a). Distance education revisited: An introduction to the issue. Tech Trends, 40(3), 2.

Simonson, M. (1995b). Does anyone really Want to learn at a distance? Tech Trends, 40(3), 12.

Simonson, M. (1995c). More than fiber: Distance education in Iowa. Tech Trends, 40(3), 13-15.

Simonson, M. (1995d). Overview of the Teacher Education Alliance, Iowa Distance Education Alliance research plan. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Ed.), Encyclopedia of Distance Education Research in Iowa (pp. 3–6). Ames, Iowa: Teacher Education Alliance.

Simonson, M. (1996). Distance education: Does anyone really want to learn at a distance? Manuscript submitted for publication.

Simonson, M. & Schlosser, C. (1995). More than fiber: Distance education in Iowa. Tech Trends, 40(3), 13–15.

Sorensen, C., Maushak, N., & Lozada, M. (1996). Iowa distance education alliance preliminary evaluation report. Ames: Iowa State University, Research Institute for Studies in Education.

Thach, L. & Murphy, L. (1994). Collaboration in distance education: From local to international perspectives. The American Journal of Distance Education, 8(3), 5–21.

Tompkins, L. S. (1993) A new light on distance learning–fiber optics. Journal of Educational Technology Systems, 21(3), 265–275.

U. S. Department of Education. (1995). The star schools program. (Available from Star Schools, U. S. Department of Education, 555 new Jersey Avenue NW, Washington, DC 20208-5644)

Watkins, B. L. (1991). A quite radical idea: The invention and elaboration of collegiate correspondence study. In B. L. Watkins & S. J. Wright (Eds.), The Foundations of American Distance Education (pp. 1–35). Dubuque, IA: Kendall/Hunt.

Young, J.R. (1995). Classes on the Web. Chronicle of Higher Education, November 3, 1995, pp. A27, A32-A33.

Distance Education:
A Review of the Literature

Nancy J. Maushak
Iowa State University

Introduction

As presented in the first chapter of this monograph, emerging technologies have forced a redefinition of distance education. The distance education research agenda has also evolved. The focus has shifted to a more learner-centered approach. Researchers are not merely looking at achievement but are examining learner attributes and perceptions as well as interaction patterns and how these contribute to the overall learning environment. While there is continued interest in the technology, the focus is not on which medium is best, but on what attributes of the medium can contribute to a positive learning experience. Both Holmberg (1987) and Moore (1995) provide guidance in the structuring of a review of distance education literature.

In his 1987 article, "The Development of Distance Education Research," Börje Holmberg, a leading distance education theorist and researcher, suggested the structure of distance education research include:

- philosophy and theory of distance education;
- distance students, their milieu, conditions and study motivations;
- subject-matter presentation;
- communication and interaction between students and their supporting organization (tutors, counselors, administrators, other students);
- administration and organization;
- economics;
- systems (comparative distance education, typologies, evaluation, etc.);
- history of distance education. (Holmberg, 1987, p. 20)

Leading researchers attending the Third Distance Education Research Symposium-Conference organized discussions around the four areas of course design, instruction, policy and administration, and learners and learning (Moore, 1995). In the area of course design, the need for evaluation of learner affective reactions, learning, transfer of knowledge to other settings, and impact on the organization was stressed. "Research to support our intuitive sense that interaction is important and necessary" (Moore, 1995, p. 3) is needed under research on instruction.

A blending of these two research agendas provided organization for this chapter as well as chapters one and three. Five categories will be discussed in this chapter: *learning outcomes, learners' perceptions, learner attributes, interaction and distance education technology.* Moore's category of course design and Holmberg's distance students category provided the basis for both *learning outcomes and learners' perceptions*. Holmberg's distance students and system categories are combined with Moore's learners and learning category to provide structure for the next two areas: *learner attributes and distance education technology.* The framework for *interaction* came from Moore's instruction area and Holmberg's communication and interaction area.

Other research categories are discussed elsewhere in this monograph. History, philosophy and theory, all categories identified by Holmberg, are covered in Chapter One. Discussion of other areas identified by Holmberg, including administration and organization and economics, as well as the policy and administration area identified by Moore may be found in Chapter Three.

Learning Outcomes

> *It is likely that when different media treatments of the same informational content to the same students yield similar learning results, the cause of the results can be found in a method which the two treatments share in common...give up your enthusiasm for the belief that media attributes cause learning. (Clark, 1994, p. 28)*

Hundreds of media comparison studies indicating, unequivocally, there is no inherent significant difference in the educational effectiveness of media support Clark's position. The specific medium used does not matter. The focus of future research should be the truly critical factor in determining student achievement: instruction itself (Whittington, 1987).

Unfortunately, much of the research being done in distance education is still of the media comparison type. Perhaps this is to be expected given the rapid development of distance education technology, especially in the area of two-way interactive television systems. With each technological advance there is the temptation to conduct media comparison research on the offhand chance that the use of the new technology might truly result in higher student achievement.

Cheng, Lehman and Armstrong (1991) compared performance of graduate-level students enrolled in traditional and computer conferencing classrooms. The on-campus class had 25 graduate students and the off-campus group included 28 in-service teachers. The groups differed significantly only on age with the average age of the off-campus students being older. A pre-test/post-test format was used measuring attitude and knowledge. Results indicated no significant difference in overall course performance or in attitudes.

Learning outcomes of an interactive telecourse in introductory High School Japanese were compared to that in a traditional class by Bruning, Landis, Hoffman, and Grosskopf (1993). The course originated in Nebraska and was transmitted to 170 schools (911 students) the first year, 255 schools (1,157 students) the second year, and 259 schools (1,330) students the third year. The achievement test had two parts and measured listening and writing.

An evaluation of the first year showed the achievement of the telecourse schools was significantly higher than the comparison schools in both listening and writing. The results for the second year were similar. Several explanations should be considered including motivation and differences in student characteristics.

Additional data were collected in the third year to investigate possible effects of motivation (measured by self-efficacy rating) and differences in student characteristics of self-reported grades in school and prior language learning experience. The mean achievement test scores for the telecourse schools continued to be significantly higher than the comparison schools even when the variables of self-efficacy, self-reported ability or prior language experience were controlled. This indicated that the achievment differences between the telecourse students and the comparison group were not related to motivational, self-reported ability, or prior experience factors (Bruning, et al, 1993).

A study by Martin and Rainey (1993) supported the findings of Bruning, et al (1993). Researchers investigated the effectiveness of interactive satellite delivery with that of traditional instruction. There was no significant difference between the two groups on the pre-test. "However, the mean post-test score for the experimental group . . . was significantly higher than that of the control group" (Martin & Rainey, 1993, p. 57).

The effectiveness of teletraining in the military was investigated by Bramble and Martin (1995). Participants were 275 individuals enrolled in five different teletraining project courses. Standard multiple-proficiency, criterion-based tests were used where available and achievement tests were developed for the other courses. In all but one course, both pre- and post-tests were administered.

Students were allowed a second chance at taking the proficiency tests and when these retakes were taken into account all students reached acceptable performance level. No comparison data were available from schools offering these courses in traditional settings but "knowledgeable training personnel indicated that this performance is as high or higher than one would normally expect" (Bramble & Martin, 1995, p. 16). In all courses where pre and post-course performance was measured, the gain was statistically significant.

Students in all five courses were asked if they felt the teletraining was as effective as live instruction. In all but one of the courses, 75% or over responded in the affirmative. The course that had only a 54% affirmative rate was the first course offered and adjustments may have been made prior to delivery of the other courses. This pattern was repeated when students were asked if they felt that the instructor was in the same room. For the first class only 78% responded yes, while for subsequent classes 84% and over responded in the affirmative.

While comparative research studies on achievement tended to show no significant difference between different delivery systems and between distance education and traditional education, several recent studies indicated a significant higher achievement level in those learning at a distance. As the accepted position is that the delivery system affects no inherent difference on achievement (Clark, 1994), then future research needs to examine what factors do indeed contribute to this difference in achievement.

Learner Perceptions

Ross, Morrison, Smith and Cleveland (1991) evaluated two programs for tutoring at-risk elementary school children at a distance: one using a local electronic bulletin board system, and a second using Applelink, a national network system featuring both electronic mail and teleconferencing. For both studies, both tutor and tutee attitudes were assessed.

In the first program, student reactions were mixed to negative. More than half of the students did not understand corrections made by their tutors, received little help with their writing skills, received insufficient time with their tutors, found the assignments difficult, and said they did not learn much from their tutors. On the positive side, slightly more than half the students felt they had enough on-line time to complete messages.

Most tutors felt they possessed the computer skills and content knowledge to do the work. They also felt they related well to their tutees and had the materials necessary. A need for more intensive training was expressed and a majority (67%) said they would have liked more personal contact with their students.

More positive results were found in the second study. Tutees felt they had a positive relationship with their tutors and preferred talking to their tutors instead of their friends. They regretted the limited amount of time for online communication.

The tutors, similar to those in the first study, felt they possessed the necessary skills. They cited communication problems as a negative aspect. Many (60%) expressed indecision on whether they had found the experience enjoyable or not.

Distance learner satisfaction was an important dimension in understanding the success of interactive telecourses. Biner, Dean and Mellinger (1994) conducted two studies to identify the major dimensions of learner satisfaction. In the first study, the telecourse evaluation questionnaire (TEQ), developed by Biner, was administered to 201 students enrolled in live, interactive televised courses at the beginning of the last class meeting. Using factor analysis, seven factors were identified. The factors were satisfaction with:

- instructor/instruction
- technology
- course management
- at-site personnel
- promptness of material delivery
- support services
- out of class communication with instructor

The second study, conducted the following year, confirmed the results of the preliminary study. The researchers concluded with emphasizing the importance of assessment of learner satisfaction to the overall success of a distance education program.

The anxiety level of distance education students and the factors contributing to anxiety were investigated by Jegede and Kirkwood (1994). Two instruments, an anxiety checklist and an oppionnaire on factors which affect learning at a distance, were administered at the beginning of the semester and at the end of the semester. Complete results were obtained from 222 distance education students enrolled at the University of Southern Queensland.

Analysis of data from the anxiety checklist indicated that participants "have a high anxiety level and were generally more anxious about their studies at the end of the semester than at the beginning" (Jegede & Kirkwood, 1994, p. 286). Results of a t-test showed a statistically significant difference between the pre-semester means and the post-semester means. However, researchers cautioned that this difference may be attributed to the timing of the post-semester administration as this occurred just prior to final examinations.

A factor analysis of the opinionnaire identified eight factors affecting learning at a distance: content, environment, finance, readiness, time, employment, family support and other. A comparison of pre-semester and post-semester showed five factor means to be significantly different at the end of the class than at the beginning. Students' concerns related to content, finance and readiness were higher at the beginning of the class than at the end, while concerns related to time and employment increased towards the end of the class (Jegede & Kirkwood, 1994).

The results of this study indicated that anxiety in distance education learners may play a higher role in attrition than previously considered. The researchers suggested future research on the role of anxiety "probably comparing on-campus with off-campus students with the introduction of other variables like achievement outcomes and a longer period of study" (Jegede & Kirkwood, 1994, p. 289).

As part of a larger study, Sorensen (1995) identified the most important predictors of student satisfaction. Surveys were returned by 210 community college students enrolled in two-way interactive televised courses. In general, the students were satisfied with their distance learning experience. In looking at the regression for all students, the variable instruction, which looks at the learning environment, accounted for 46 percent of the variance. "Adding the variables of membership, course management, and technical aspects increased the variance prediction to 55 percent" (p. 141).

However, if the group is split by location, some differences become apparent. Instruction accounted for only 40 percent of the variance for origination site students while instruction accounted for 49 percent of the variance for remote students. Adding course management, which focuses on logistics and resources, into the equation for remote students accounts for 57 percent of the variance. For the origination site students, adding the variable of membership, defined as being part of the class or belonging, and the variable of technical aspects, which related to equipment adequacy, increased the percent accounted for to 53 percent. It would appear that instruction was the most important variable related to satisfaction for all groups. For remote students, course management was a key component of overall satisfaction, while for origination site students, a sense of belonging was more important to overall satisfaction (Sorensen, 1995).

Fast (1995) investigated student motivation toward multisite instruction of students enrolled in foreign language courses delivered by fiber-optic network allowing multisite, interactive instruction. Nineteen students participated in the study, 11 at the origination site and eight at the remote site. Post-instruction questionnaires administered to all students provided data on the three variables of student motivation, perceived learning, and involvement.

Remote students had a significantly more favorable attitude toward interactive TV than the origination site students. Responses to open-ended questions asking likes and dislikes of interactive TV classes help clarify this difference.

Students at both locations cited two reasons for liking the multi-site instruction: "human interest and facilitation of learning" (Fast, 1995, p. 17). Students at the remote site felt the delivery system provided opportunities for learning that would not be available otherwise.

The two groups differed strongly on their dislikes. A high number (over 40%) of the dislikes identified by the origination site were organizational issues. Of special concern was the loss of class time due to the need to transport students to the technology classroom. This was not an issue for the remote site students.

The majority of criticisms (60%) from the remote site students focused problems with interaction. They disliked the lack of opportunity to interact one-on-one with the instructor. Discussions were difficult as everyone talked at once and posing questions necessitated interrupting class. Origination site students also identified the loss of interaction with the instructor as a problem. "These results would suggest that remote-site students tended to experience difficulty in being accepted as part of the discourse domain, while origination-site students found it more difficult to share their teacher with a remote-site" (Fast, 1995, p. 18). Analysis of questions related to perceived learning showed no significant differences between remote site students and on-site students. However, a comparison of $1/2$ level students and $3/4$ level students at the remote site showed a significant difference in their perceptions of how well you can learn at a distance. Lower level students tended to indicate that you can learn at least as well in remote site/on-site environment as in a single site environment. A similar situation was found when data on perceived interaction was analyzed. While there was no significant differences between sites, there was a significant difference between levels. Higher level students at the remote site indicated that having the teacher at a distance could hinder learning.

Research related to learners' perceptions has focused on identifying factors related to satisfaction, attitudes and perceived learning and interaction. Factors affecting satisfaction may be organizational and involve the environment, management and support services (Biner, et al, 1994) or they may by individual factors including readiness, time and family support (Jegede & Kirkwood, 1994). It is difficult to separate the factors related to satisfaction from the individual, the specific setting and the influence of time on changes in student perceptions.

Positive attitudes were found in students at the remote site of an interactive television class. In general, they felt they learned as well as if in a regular classroom and that having the teacher at a distance did not hinder their learning (Fast, 1995).

Learner Attributes

Coggins, (1988) in a study of students associated with the University of Wisconsin System External Degree Program, examined the relationship between "personal variables" (learning style and demographic data) and program completion rate. She found that completers and noncompleters did not differ significantly on variables related to gender, occupation, marital status, presence or absence of children, distance from campus, or age of entry into the baccalaureate program. However, there was a significant difference between the two groups for a number of variables. Completers had entered the program with higher levels of education and they had greater expectations of earning higher grades as well as greater expectations of earning a degree. The two groups of students differed in their preference of course content. Noncompleters tended to be more concrete learners prefering a content that allowed them to work with things instead of people. Completers preferences were for a content that involved interviewing and counseling people (Coggins, 1988).

The relationship between gender and success in distance education courses was the subject of a study by Ross and Powell (1990). Data from the 1987-88 school year at Athabasca University, in Alberta, Canada, indicated that a greater percentage of women passed distance education courses. Further, "this higher completion trend was visible irrespective of the student's general study area, specific course selection, course level, mode of course delivery, student's program status, or the number of courses students had previously taken" (p. 10).

An exploratory analysis assessing demographic, motivational, support and learning style variables indicated some possible reasons for the gender differences in academic achievement. These included differences in marital status, employment, and use of institutional support between the two groups. An important differences was noted in the motivational variable as women felt gaining a university credential was critical and the impact of failing serious (Ross & Powell, 1990).

Dille and Mezack (1991) studied the use of locus of control and learning style as predictors of high-risk among college distance education students. One hundred fifty-one students enrolled in lower division telecourses completed the instruments which included demographic information, Internal-External Locus of Control Scale (RIELC), and Learning Style Inventory (LSI).

The locus of control measure was a significant predictor of two variables: success, defined as receiving a grade of C or above, and of actual letter grade. Students with a more internal locus of control were more likely to be successful and to obtain a higher grade. Students with an external locus of control "would be less likely to persevere when faced with the perceived tougher challenge of a telecourse" (Dille & Mezack, 1991, p. 29).

An analysis of the data from the learning style inventory indicated that students who were more successful had a lower LSI average score measuring concrete experience. On the abstract conceptualization/concrete experience scale where a lower score indicates a more concrete learner, successful students had a significantly higher score than nonsuccessful students. This supported the idea that "the less concrete one's learning style, the better suited one is to learn in the telecourse format" (Dille & Mezack, 1991, p.31). While examing the abstract/concrete scale may be helpful in predicting success in a distance learning environment, individual learning style was not found to be a significant predictor of success.

Based on Dille and Mezack's (1991) study, the profile of a high-risk telecourse student would be:

- 25 years or older
- divorced
- less than 30 college credit hours completed
- GPA less than 3.0–2.9
- Higher than average Locus of Control score indicating internal locus of control
- Lower than average AC-CE score indicating an abstract learner. (p. 34)

Laube (1992) examined the relationship between academic and social integration variables and the persistence of students in a secondary distance education program. Students were divided into two groups based on persistence. Completer/persisters were those who completed or still persisted in course work one year after enrollment while dropout/nonstarters had dropped out during the same time.

One hundred eighty-one surveys were returned out of 351 surveys mailed, 124 in the completer/persister group and 57 in the dropout/nonstarter group. Interestingly, in the nonreturned surveys there were 44 completer/persisters and 126 dropout/nonstarters.

Of the three variables included in academic integration, two showed a significant difference between the groups. Completers/persisters were more likely than dropout/nonstarters to have higher educational goals and to study more than 10 hours a week. For the third variable, amount of family assistance, there was no significant difference between the two groups.

The three variables related to social integration were self-initiated contact with the school, student attitudes toward their tutors, and student attitude toward missing peer socialization. The two groups differed significantly only in their attitudes toward their tutors with completer/persisters indicating a more positive attitude. Both groups indicated a positive attitude toward their tutors but a large percentage of dropout/nonstarters selected undecided as a response which contributed to the significant results obtained (Laube, 1992).

Stone (1992) examined the relationship of tutor contact and locus of control with course completion rates for students enrolled in print-based, distance training courses. The treatment group received weekly phone calls from the training staff while the comparison group received only minimal feedback. Results did not show a statistically significant difference between the two groups in course completion rates. However, Stone did find that students "with relatively external loci of control completed their coursework at significantly faster rates when exposed to regular telephone cues from their tutors" (Stone, 1992, p. 9).

How study practices and attitudes of students in a distance learning program related to academic success was examined by Bernt and Bugbee (1993). The sample consisted of approximately 300 students with even representation from achievement categories: high-passers, low-passers, and failers. Demographic data showed the subsamples based on achievement categories to be similar except for educational level. The high-passers were likely to have advanced degrees.

Two types of study strategy dimensions with distance education students were examined: primary strategies "which

BEST COPY AVAILABLE

are used to identify, understand, remember, and apply important subject matter" (Bernt & Bugbee, 1993, p. 97) and secondary or support strategies "which involve the formation and maintenance of attitudes related to learning and academic performance" (p. 98). The researchers concluded from their study that there was evidence that both primary and secondary strategies aided academic performance. Passers differed significantly from failers in their test strategies, concentration, and time management skills, but were not significantly different in active processing, diligence, and positive attitude.

The researchers also found that students with different education levels differed in their study strategies, notably in time management, concentration, and testing strategies. This, they concluded, suggested "that distance learning students who have not completed college are 'at-risk' primarily because they lack metacognitive or executive skills for approaching coursework and examination-taking" (Bernt & Bugbee, 1990, p. 108). Distance education instructors need to be aware that, similar to traditional education students, learners are different and some need more direction and structure than others who may be more self-directed.

Garland (1993) used ethnographic procedures to identify barriers to persistence in distance education. Building on the framework of Rubenson (1986), barriers were classified into four categories: situational, institutional, dispositional, and epistemological. Face-to-face interviews were conducted with 47 students enrolled in primarily print based introductory academic courses. Seventeen withdrawal students, students who did not complete the final exam, and 30 persisting students, students who took the final exam regardless of outcome, participated in the study.

Barriers to persistence in all four categories were encountered by both withdrawal students and persisting students. Situational barriers included poor learning environment and lack of time. Students indicated a lack of support from both family and peers contributed to a poor learning environment. They also identified available resources and a quiet place to study as problematic. Students felt the course took more time than anticipated especially as many were juggling the demands of work, home and school (Garland, 1993).

Cost, institutional procedures and course scheduling/pacing were reported as institutional barriers. Tuition was not a problem but add-on costs of texts and labs were seen as barriers to persistence. Students who felt the university did not try to meet their needs identified both institutional procedures and course scheduling/pacing as problems. Limited office hours made reaching staff for assistance difficult (Garland, 1993).

The largest number of barriers to persistence identified related to the psychological and sociological nature of the student (dispositional barriers). These barriers included: 1) uncertainty of an educational or professional goal 2) stress of multiple roles (school, work, home), 3) time management problems, 4) problems associated with learning style differences, and 5) adult pride indicated by overachievement and/or fear of failure (Garland, 1993).

The last category identified barriers within the student's conceptual framework. "The student's epistemological stance is a screen through which new knowledge must be acquired. The screen can become a barrier when the epistemological stance of a course's content or expectations is incompatible" (Garland, 1993, p. 192).

The study points to the individualness of learning whether at a distance or in a traditional setting. Regardless of the setting, the focus needs to be on creating the optimal learning conditions for each individual.

Pugliese (1994) investigated psychological variables as predictors of persistence in telecourses. Independent variables included loneliness, communication apprehension, communication competence and locus of control. Persistence/withdrawal behavior was the dependent variable with respondents divided into quartiles based on the percentage of courses from which they either withdrew or failed. Three hundred six urban commuter students (39% response rate) enrolled in telecourses responded to a telephone survey.

Though results did not prove significant, the implications drawn are interesting. In a traditional classroom it would be expected that the students possessing greater social interaction skills would be more likely to persist and complete the course. Results not proving significant appear to indicate that telecourses are the social equalizer. "Telecourses apparently minimize both the assets and liabilities of social skills" (Pugliese, 1994, p. 34).

In this study, the correlation between dyadic communication apprehension and withdrawal, while nonsignificant, was the strongest correlation indicating one possible area for future research. Because communication between student and instructor as part of the telecourses investigated was almost exclusively by telephone, other possible avenues for future research might include telephone apprehension or "data collection other than telephone survey to eliminate the telephone itself as an intervening variable" (Pugliese, 1994, p. 35).

Fjortoft (1995) similarly investigated predictors of persistence in distance learning programs. Based on the literature of adult education, a model relating adult learners to persistence, including eight variables, was developed. Independent variables included age, gender, GPA at time of college graduation, satisfaction with college experience, intrinsic job satisfaction, ease of learning on their own, intrinsic benefits of degree completion, and extrinsic benefits of degree completion. Persistence was defined by active enrollment status.

The 395 students surveyed included those actively enrolled in a distance learning program in pharmacy and students who had been admitted but had withdrawn before completion. The response rate was 50% with a sample size of 198. The predictive validity of the model was tested using regression analysis.

Three variables were significant in predicting persistence in distance learning programs. Results indicated a positive relationship between perceived intrinsic benefits and continued enrollment while a negative relationship between both age and ease of learning on their own and persistence was indicated. "An internal desire for more satisfaction and challenge in one's career more than desires for enhanced salary and career mobility" (Fjortoft, 1995, p. 6) motivates adults to continue their education. The respondents ranged in age from the upper twenties to just over sixty. Results indicated it was more difficult for the older students to persist in the distance learning program than it was for younger students.

Because of the individual orientation of the distance learning program investigated, it was expected that students with a higher level of ease of learning on their own would be more likely to persist. In fact, the opposite was indicated. Fjortoft (1995) discussed two possible reasons for this unanticipated result. Only individuals who recognize that they possess the skills necessary to learn on their own elect to enter a distance learning program. "Alternatively, adults may not be able to realistically assess their individual learning styles" (p. 6).

Biner, Bink, Huffman and Dean (1995), building on the work of Dille and Mezack (1991), investigated the role of personality characteristics in predicting achievement in televised courses. The Sixteen Personality Factor Questionnaire was administered to both traditional-course and televised-course students to determine how the two groups differ and also to identify personality factors predictive of success in televised-courses.

The personality profiles of the two groups did differ significantly. "Telecourse students tend to be more intelligent, emotionally stable, trusting, compulsive, passive, and conforming than traditional students" (Biner, et al, 1995, p. 56).

Results indicated that several personality characteristics correlated significantly with course achievement. The group-oriented/self-sufficient dimension was positively related to course performance indicating successful telecourse students tend to be self-sufficient. A negative relationship was found between the introvert/extrovert dimension and course performance. This indicated that the more introverted a student was the better they performed in a distance education setting. This supported what one would expect in a distance learning environment (Biner, et al, 1995).

A negative correlation was identified between course achievement and the undisciplined/controlled dimension. This indicated that the more successful telecourse student tends to be more lax or undisciplined. This result may be misleading as the telecourse group as a whole tended to be more persistent or rule-bound in their behaviors (Biner, et al, 1995).

Finally, higher levels of expedience were associated with higher grades in the telecourse group. This was in contrast to higher levels of conscientiousness associated with higher grades in the traditional course group. Telecourse students tended to be older and are juggling responsibilities of job and home and "higher levels of expedience aid the telecourse students in terms of functionally adapting to the diversity of their responsibilities" (Biner et al, 1995, p. 57).

In review of the above studies, several learner characteristics seem to have some effect on the success of the learner in a distance education environment. While studies on the effects of gender (Ross & Powell, 1990 & Coggins, 1988) indicated mixed results, students who are younger (Fjorloft, 1995) and have a higher level of education (Coggins, 1988 & Brent & Bugbee, 1993) were more likely to complete a distance education course.

Motivation played a major role. Intrinisically motivated learners (Fjortoft, 1995) and those with high expectations for grades and completion of a degree (Coggins, 1988; Laube, 1992; Ross & Powell, 1990) tended to have a higher success rate. A positive attitude toward the instructor (Laube, 1992) may also be a factor contibuting to the success of a distance learner.

Dille and Mezack (1991) and Stone (1992) both found locus of control to be a significant factor. More abstract learners with internal locus of control (Dille & Mezack, 1991) and skills in learning alone (Fjortoft, 1995) were more successful. Providing students possessing external locus of control with regular contact with the instructor increased their chances of success (Stone, 1992).

Individual learning style did not prove to be a significant predictor of success. Distance education seemed adept in providing for the learning needs of students with a variety of learning styles (Dille & Mezack, 1991).

Interaction

Beare (1989) compared the effectiveness of six instructional formats which allowed differing levels of interaction: 1) lecture, 2) lecture with videotape back-up, 3) telelecture, 4) audio assisted independent study, 5) video assisted independent study, and 6) video on campus. One hundred seventy-five nontraditional teacher education students participated in the study.

Not surprisingly, given the history of media comparison research, "individual instructional formats had little effect on student achievement" (Beare, 1989, p. 64). The amount of interaction also appeared to have had no impact on student achievement.

Course evaluations yielded some interesting results, however. Analysis showed that "distant learners found the course just as stimulating, were equally interested in the subject matter, and judged the instructor equally as skilled as did those receiving face-to-face instruction" (Beare, 1989, p. 65). The on-site students in the telecourse strongly disliked the medium. "One night, when the electronic equipment failed temporarily, the class spontaneously cheered" (p. 65).

Bauer and Rezabek (1992) compared verbal interaction under three conditions: 1) two-way audio and video, 2) two-way audio, 3) traditional instruction. The study included 172 students pursuing teacher certification randomly assigned to one of the three treatment groups.

There was no significant difference in total number of interactions between the audio/video group and the audio group. There was, however, a statistically significant difference between the audio/video group and the traditional group as well as between the audio group and the traditional group. Results seemed to indicate that merely the addition of video in the distance education format does not increase interaction. This could be a result of the conditioned passive response of individuals to viewing television. Simply measuring interaction may not be the answer in discovering variables contributing to increased interaction.

Souder (1993) investigated interaction and achievement of students in traditional delivery courses compared to students in a distance delivery course. Three groups of students enrolled in the same course participated in the study with each group in a different setting. One group was in a traditional classroom; the second group was on site with the instructor while the class was broadcast to the third group at a distance. The instructor, the course content, and the course evaluation requirements were the same for each group.

There was no significant difference between the two traditional delivered courses on evaluation questionnaire items addressing face-to-face interaction. However, the responses of the distance group were significantly different from both the on-site group and the traditional group. The students at a distance "defended their distance learning experiences. They did not agree that face-to-face instruction with a live instructor was vital, nor did they believe that real time interactions with other students were vital" (Souder, 1993, p. 44). The students in traditional settings disagreed and did not feel that a distance class would be the same quality as the more traditional approach to instruction.

The results seemed to indicate that students at a distance tended to bond more with their fellow classmates and the instructor. They appeared supportive of each other and, in general, felt they performed better than the other two groups. In fact, the overall achievement of the distance group was significantly higher than the on-site group.

Souder (1993) concluded

> the distance learners in this study were observed to gain much more than a traditional education from their experiences. They gained a broadened network of valuable colleagues, skills in working with others and collaborating across distances, and many social skills beyond those offered by traditional settings. (p. 50)

Using semi-structured personal interviews, May (1993) investigated the contribution of interaction to women's learning experiences in women's studies courses delivered using distance education. Nine women of varied background and experiences were interviewed. Course delivery was mostly one-way technology and content focused on the dissemination of knowledge with little interactivity.

Students did not appear to miss the interaction or to recognize the potential benefits. The general feeling was that increasing student interaction would require arranging face-to-face meetings. Due to travel, and home and work responsibilities, making time for these meetings was not desirable. They questioned the value and desirability of increased collaboration.

"The women in this study did not believe that isolation among distance learners necessitated a negative learning experience" (May, 1993, p. 44). The researcher concluded that "increased learner interaction is not an inherently or self-evidently positive educational goal or strategy" (p.47).

Fulford and Zhang (1993) examined the relationship of perceived interaction and satisfaction in an in-service training course delivered by the Hawaiian Interactive Television System (HITS). One hundred twenty-three students completed surveys at the beginning, mid-point and end of the 10 week course. Participants responded to questions related to three variables: personal interaction, overall interaction, and satisfaction with the value and quality of instruction.

Perceived level of personal interaction was only a moderate predictor of satisfaction, approximately 15% of the variance. Perceived level of overall interaction accounted for almost three times as much variance in satisfaction. "Learner satisfaction may be attributed more to perceived overall interactivity than to individual participation" (Fulford & Zhang, 1993, p. 18). Probably instructors using interactive television should focus more on building group interaction rather than individual participation.

This study also examined the variable of time. Learners' perceptions of interaction and satisfaction decreased over the length of the course, however, overall interaction "becomes a more stable predictor of satisfaction as learners become more experienced with the technology" (Fulford & Zhang, 1993, p. 19).

In a follow-up study, Zhang and Fulford (1994) investigated the variable time. Participants were 260 students enrolled in a course delivered by HITS. While this study also looked at perceived interaction and satisfaction, variables were expanded to include attitude towards interaction and actual interaction time determined by analyzing video tapes of each session.

The correlation between perceived interaction and actual interaction time was non-significant. "Reserving a considerable portion of TV time for interaction, a common strategy among TV instructors, does not seem to have quite as much relevance to the psychological reality of interactivity as one's intuition would suggest" (Zhang & Fulford, 1994, p. 61). This seems to support the work of May (1993) that more interaction is not necessarily better.

While the correlation between actual interaction time and attitude was nonsignificant, the relationship between perceived interaction and attitude was near perfect ($df=8$, $r=0.98$, $p<0.01$). Similar relationships were found when correlating actual interaction and perceived interaction with satisfaction. "Increasing interaction time merely for more time's sake" (Zhang & Fulford, 1994, p. 62) ignores the fact that the role of the student is central in the learning process.

Communication and teaching patterns that contribute to student participation were examined in a study by Schoenfelder (1995). Forty-four students and 11 teachers participating in interactive television courses comprised the sample. A questionnaire was used to measure teachers' and students' perceptions of ways to increase interaction and involvement.

Both teachers and students felt that an enthusiastic teacher with a sense of humor was an important factor in enhancing involvement. They also identified addressing students by name and providing timely feedback as factors that made a positive contribution to interaction. Specific teaching habits were found to help increase student involvement. These included varying the learning activities and using a variety of visual materials (Schoenfelder, 1995).

Using observations, interviews and videotapes, Baker (1995) examined the interactive teaching behaviors of five faculty members teaching courses using distance education technology. Seven broad categories of teaching behaviors were identified. These dimensions were:

- nonverbal "immediacy" behaviors,
- verbal "immediacy" behaviors,
- behaviors that personalize the class
- technology management strategies,
- methods for acquiring student feedback,
- methods used to manage student participation, and
- active learning strategies. (p. 109)

Three of these behaviors will be discussed here. Nonverbal behaviors that conveyed a feeling of approachability and warmth increased involvement of students at the remote site. Specific behaviors included making eye contact with the camera, using gestures, and using camera angles and shots that allowed students to see facial expressions. Verbal "immediacy" behaviors that were found to contribute to student involvement included the use of humor, frequent positive encouragement and the frequent sharing of personal examples when relevant. Teachers used a variety of methods for acquiring student feedback that improved student involvement. Most of the teachers relied , at least partially, on the nonverbal cues of the students at the origination site. Some used a variety of questioning techniques, while others used more formal, written formative evaluations (Baker, 1995).

Research regarding interaction and distance education technologies pointed to the fact that different technologies allow differing degrees of interaction (Bauer & Rezabeck, 1992). However, similar to comparison studies examining achievement, research comparing differing amounts of interaction showed interaction had little effect on achievement (Beare, 1989 & Souder, 1993). Those students who had little or no interaction as part of the course did not seem to miss it (May, 1993).

While the above seems to point to the unimportance of interaction, a conflicting study indicated a high correlation between perceived interaction and attitude (Zhang & Fulford, 1994). Possibly the emphasis should not be on individual participation but on building group interaction and feeling of community.

BEST COPY AVAILABLE

Distance Education Technology

Numerous studies have described or examined the efficacy of individual forms of distance education, while others have examined aspects or components of those forms. Garrison (1990) used a description of audio teleconferencing to argue for an appropriate concentration on the role of the teacher and the importance of two-way communication in the education process. Along the way, he argued for the appropriate, conservative use of interactive communication technologies.

The core of Garrison's argument was that:

> education, whether it be at a distance or not, is dependent upon two-way communication. There is an increasing realization in the educational community that simply accessing information is not sufficient. In an educational experience information must be shared, critically analyzed, and applied in order to become knowledge. (Garrison, 1990, p.13)

A goal of some distance education programs was to make education more student-centered through the prepackaging of instructional materials that students may use when convenient. However, Garrison argued that this approach "ignores the essential nature of an educational learning experience" (Garrison, 1990, p. 14). For Garrison, this "simply risks making learning more private and therefore less likely to transform the views and perspectives of the learner in a positive developmental manner" (p. 14).

Garrison argued that "the quality and integrity of the educational process is dependent upon sustained, two-way communication" (Garrison, 1990, p. 15). Such communication, between student and teacher, and between student and student, is the prime benefit of teleconferencing. When this technology is applied to distance education, "the result is that distance education is no longer necessarily an independent and isolated form of learning but, instead, begins to approach the interactive ideal of an educational experience" (p. 15).

Garrison is a staunch supporter of audio teleconferencing, which he regards as "a distinct generation of distance education capable of providing unique and varied teaching/learning possibilities. Independent and isolated study is no longer the hallmark of distance education" (p. 17).

Egan, Welch, Page, and Sebastian (1992) examined graduate students' perceptions of three instructional delivery systems: 1) conventional delivery, 2) closed-circuit microwave system (EDNET), and 3) videotape recordings (Professor Plus). Near the conclusion of the course, 514 students evaluated the delivery systems using the Media Evaluation Survey. This instrument allowed individuals the opportunity to evaluate instructional media on ten elements:

> 1) amount of material covered, 2) level of difficulty, 3) degree to which the course content was well organized, 4) clarity of the content, 5) degree to which the various proograms and instructional activities were relvant to the course objectives, 6) excellence or lack of excellence of the presenter's delivery, 7) extent to which text and weekly assignments were integrated with each week's class, 8) value of slides, filmds, and other visual materials, 9) value of text screens to support the presenter's delivery, and 10) degree to which the course held the student's interest. (p. 50)

In comparing conventional delivery with EDNET, results showed six of ten variables to be significantly different. The conventional delivery group gave higher ratings to organization, clarity, relevance, integration, value of visuals, and value of text screens. A comparison of conventional delivery with Professor Plus yielded similar results with a significant differences shown on the two additional variables of adequacy of presenter's delivery and student interest which were rated higher by the conventional delivery group.

A comparison of the two television delivery systems, EDNET and Professor Plus, showed a significant difference on only one variable. The mean of the EDNET group's ratings on the value of visuals variable was higher than the mean of the Professor Plus group's ratings. These two types of television delivery systems were seen as virtually comparable.

An analysis of the educational attributes of two forms of communication technology was done by Tuckey (1993). The electronic white board, a form of synchronous audioconferencing, and asynchronous computer conferencing were reviewed. It was not the intent of the analysis to identify one form of communication as better than the other.

Face-to-face interaction was available in the uses of the electronic white board reviewed. Students met in small groups with the aural presence of the instructor This element "provides opportunities for social interaction, for mutual support, and for collaborative learning…it provides more possibilities for group work than does audioconferenceing" (Tuckey, 1993, p. 62).

The computer conferencing permitted only text-based communication. Several negative aspects, including limits in retrieval and display capabilities, contributed to difficulties in collaboration. Group work is also difficult due to the asynchronous nature of this technology.

The researcher concluded that each form of communication has its advantages. There was a need to review the attributes of the technology used for distance education.

Visual channels may be more important in "subject areas such as mathematics and the sciences, whereas (computer conferencing) may be more suitable in areas requiring extensive discourse" (Tuckey, 1993, p. 70).

Ahern and Repman (1994) examined two different delivery technologies and the effect on interaction. Interaction is sometimes inhibited in distance education systems. The attributes of specific delivery technologies may contribute to both the quantity and the quality of teacher-student and student-student interactions.

In the first study, researchers analyzed video tapes of a class delivered using two-way audio/two-way video technology. Levels of teacher-student interaction were identified. Teachers talked 62% of the time with students talking 38% of the time. The percent of questions asked was divided almost equally between students and teachers.

In the second study, Ahern and Repman (1994) examined computer mediated communication systems and the impact on interaction. Two versions of software were developed for this study. The first used a graphic-based discussion map while the second was a more traditional text version. "Students in the graphic interface produced significantly . . . more messages . . . than students using the textual interface" (p. 541). While a comparison of time spent using the software was not statistically significant, the students using the graphic version spent approximately 25% more time per visit.

As with any instructional medium, it is important to examine the attributes and how they contribute to the learning outcome. The studies above suggest that different distance education technologies meet different needs. Two-way communication is an essential component of the learning environment (Garrison, 1990). Collaboration with other students and with the instructor is possible and easier today then previously due to advancements in technology. Does this make these technologies better? Not necessarily. Continued research needs to examine the setting, context as well as the media attributes to determine variables contributing learner outcomes.

Summary

While it is always perilous to summarize research in a few sentences, it is also the obligation of those who have studied the literature extensively to provide others with their best estimates of what is reported. The distance education literature has several characteristics that make summarizations difficult. The largely anecdotal nature of distance education literature, reporting results of a specific project makes it difficult to generalize. Widely criticized comparison studies continue to be popular. Comparing the achievements of distance learners to traditional learners or between distance learners using different technologies continue to show "no significant difference". Subjects tend to be highly motivated, adult learners providing little help in generalizing to other populations.

In spite of these limitations, it is possible to draw the following tentative conclusions from the research literature. While these summary statements should be interpreted skeptically, they are supported by the literature.

- Distance education is just as effective as traditional education in regards to learner outcomes.
- Distance education learners generally have a more favorable attitude toward distance education then traditional learners and distance learners feel they learn as well as if they were in a regular classroom.
- Successful distance education learners tend to be abstract learners who are intrinsically motivated and possess internal locus of control.
- While interaction seems intuitively important to the learning experience, interaction should not be added without real purpose.
- Focusing on building collaboration and group interaction may be more important than focusing on individual participation.
- Each form of distance education technology has it own advanatages and disadvantages in contibuting to the overall quality of the learning experience.

The research clearly shows that distance education is an effective method for teaching and learning. Future research needs to focus on: different populations, particularly K–12 students; psychological and social attributes of the learner; the impact of distance education on the organization; and the contributions of different media attributes to learning outcomes.

References

Ahern, T.C., & Repman, J. (1994). The effects of technology on online education. Journal of Research on Computing in Education, 26 (4), 537–546.

Baker, M. H. (1995). Distance teaching with interactive television: Strategies that promote interaction with remote-site students. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 107–115). Ames, Iowa: Teacher Education Alliance

Bauer, J. W., & Rezabek, L. L. (1992). The effects of two-way visual contact on student verbal interactions during teleconferenced instruction. (ERIC Document Reproduction Service No. ED 347 972)

BEST COPY AVAILABLE

Beare, P. L. (1989). The comparative effectiveness of videotape, audiotape, and telelecture in delivering continuing teacher education. The American Journal of Distance Education, 3(2), 57–66.

Bernt, F. L., & Bugbee, A. C. (1993). Study practices and attitudes related to academic success in a distance learning programme. Distance Education, 14(1), 97–112.

Biner, P. M., Bink, M. L., Huffman, M. L., & Dean, R. S. (1995). Personality characteristics differentiating and predicting the achievement of televised-course students and traditional-course students. The American Journal of Distance Education, 9(2), 46-60.

Biner, P. M., Dean, R. S., & Mellinger, A. E. (1994). Factors underlying distance learner satisfaction with televised college-level courses. The American Journal of Distance Education, 8(1), 60–71.

Bramble, W. J., & Martin, B. L. (1995). The Florida teletraining project: Military training via two-way compressed video. The American Journal of Distance Education, 9(1), 6–26.

Bruning, R., Landis, M., Hoffman, E., & Grosskopf, K. (1993). Perspectives on an interactive satellite-based Japanese language course. The American Journal of Distance Education, 7(3), 22–38.

Cheng, H. C., Lehman, J., & Armstrong, P. (1991). Comparison of performance and attitude in traditional and computer conferencing classes. The American Journal of Distance Education, 5 (3), 51–64.

Clark, R. E. (1983). Reconsidering research on learning from media. Review of Educational Research, 53(4), 445–459.

Clark, R. E. (1994). Media will never influence learning. Educational Technology Research and Development, 42(2), 21–29.

Coggins, C. C. (1988). Preferred learning styles and their impact on completion of external degree programs. The American Journal of Distance Education, 2(1), 25–37.

Dille, B., & Mezack, M. (1991). Identifying predictors of high risk among community college telecourse students. The American Journal of Distance Education, 5 (1), 24–35.

Doerfort, D. L. & Miller, W. W. (1995). Using diaries assess the learning needs and course performance of students served by three instructional delivery means. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 117–126). Ames, Iowa: Teacher Education Alliance

Egan, M. W., Welch, M., Page, B., & Sebastian, J. (1992). Learners' perceptions of instructional delivery systems: Conventional and television. The American Journal of Distance Education, 6(2), 47–55.

Fast, M. (1995, April). Interaction in technology: Mediated, multisite, foreign language instruction. Paper presented at theAnnual Meeting of the American Educational Research Association, San Francisco, CA.

Fjortoft, N. F. (1995). Predicting persistence in distance learning programs. (ERIC Document Reproduction Service No. ED 387 620)

Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. The American Journal of Distance Education, 7(3), 8–21.

Garland, M. R. (1993). Student perceptions of the situational, institutional, dispositional, and epistemoloical barriers to persistence. Distance Education, 14(2), 181–198.

Garrison, D. R. (1990). An analysis and evaluation of audio teleconferencing to facilitate education at a distance. The American Journal of Distance Education, 4(3), 13–24.

Holmberg, B. (1987). The development of distance education research. The American Journal of Distance Education, 1(3), 16–23.

Jegede, O. J., & Kirkwood, J. (1994). Students' anxiety in learning through distance education. The American Journal of Distance Education, 15(2), 279–290.

Laube, M. R. (1992). Academic and social integration variables and secondary student persistence in distance education. Research in Distance Education, 4(1), 2–5.

Martin, E. E., & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. The American Journal of Distance Education, 7(1), 54–61.

May, S. (1993). Collaborative learning: More is not necessarily better. The American Journal of Distance Education, 7(3), 39–50.

Moore, M. G. (1995). The 1995 distance education research symposium: A research agenda. The American Journal of Distance Education, 9(2), 1–6.

Pugliese, R. R. (1994). Telecourse persistence and psychological variables. The American Journal of Distance Education, 8(3), 22–39.

Rogers, E. M. (1983). Diffusion of innovations. New York: The Free Press.

Ross, L. R., & Powell, R. (1990). Relationships between gender and success in distance education courses: A preliminary investigation. Research in Distance Education, 2(2), 10–11.

Ross, S. M., Morrison, G. R., Smith, L. J., & Cleveland, E. (1991). An evaluation of alternative distance tutoring models for at-risk elementary school children. (ERIC Document Reproduction Service No. ED 335 009)

Rubenson, K. (1986). Distance education for adults: Old an new barriers for participation. In van Enckevorrt, G., Harry, K., Morin, P., and Schutze, H. G. (eds) Distance Higher Education and the Adult Learner: Innovations in Distance Education, (Vol 1). Heelern, the Netherlands: Dutch Open University, 39–55.

Schoenfelder, K.R. (1995). Studenti nvolvement in the distance education classroom: Teacher and student perceptions of effective instructional methods. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 79-85). Ames, Iowa: Teacher Education Alliance

Sorensen, C. K. (1995). Attitudes of community college students toward interactive television instruction. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 131–148). Ames, Iowa: Teacher Education Alliance

Souder, W. E. (1993). The effectiveness of traditional vs. satellite delivery in three management of technology master's degree programs. The American Journal of Distance Education, 7(1), 37–53.

Stone, T. E. (1992). A new look at the role of locus of control in completion rates in distance education. Research in Distance Education, 4(2), 6–9.

Tuckey, C. J. (1993). Computer conferencing and the electronic white board in the United Kingdom: A comparative analysis. The American Journal of Distance Education, 7(2), 58–72.

Whittington, N. (1987). Is instructional television educationally effective? A research review. The American Journal of Distance Education, 1(1), 47–57.

Zhang, S., & Fulford, C. P. (1994). Are interaction time and psychological interactivity the same thing in the distance learning television classroom? Education Technology, 34(6), 58–64.

Distance Education: Operational Issues

Chris Sorenson
Iowa State University

The organizational pattern and operating practices of a distance education establishment are, of course, based on the educational philosophy of that institution as well as some economic and political restrictions (Verduin & Clark; 1991, p. 166).

A well-run distance education enterprise is the product of people, planning, and technology. It does not happen overnight, nor is it bereft of problems. As the power of technology increases at rates that seem exponential in nature, the intricacies of operating distance programs on a daily basis become equally complicated (Rumble, 1992; Verduin & Clark, 1991). In any endeavor of such scope, it is inevitable that despite the most careful planning, issues will arise that require policies to be determined and put into place (Murgatroyd & Woudstra, 1989; Hezel, 1991; Miller, 1991).

The purpose of this article is to review operational issues related to the administration and management of distance education. Of primary interest are those policies that provide a structure for successful distance education programs.

It is possible to glean, from currently available literature, a number of common issues inherent in the operation of distance education programs. These issues can be divided into four major categories: management, personnel, facilities, and curriculum.

Among the issues included within these categories are training and evaluation of teachers, students, and staff; implementing and managing the technologies; support services for teachers and students; equipping, scheduling and maintaining facilities; and making decisions about content, development and evaluation of curriculum. This article will examine each of these categories and the issues within them.

Operational issues occur at all levels of distance education enterprises; local, state, national, and international. Telecommunications and interactive delivery systems can bring the teacher directly to distance students (U. S. Congress, 1989). Connecting students and teachers across borders forces issues at international and national levels as well as state and local levels (Collis, Veen, & De Vries, 1993; McGreal & Simand, 1992; Davis & Elliot 1989). It is the job of the various management and administrative bodies to consider the issues and construct policies designed to facilitate effective solutions in concert with political and economic policy-making agendas (Olcott, 1992; Miller, 1991; Collis, Veen & De Vries, 1993).

Management Issues

Issues concerning distance education enterprises involve both internal and external elements of the organization; recognize no geographic boundaries; and occur at the local, statewide, national and international levels. Within the purview of distance education management and administration there are issues arising from:

- the need for increased coordination and communication,
- the need for detailed internal and external program evaluations,
- the need for cooperation among the business, government, and education sectors, and
- the desire for a nationally accepted set of teacher certification standards.

Coordination and Communication

Distance education enterprises are highly complex organizations. The issues concerning them are as complex as the enterprises themselves. In order to be successful, distance education enterprises require a high degree of planning, management control, and communication.

Rumble (1992) states that the key to successful management of distance education lies in planning, organization, leadership, and control. "Management is the effective utilization of human and materials resources to achieve the objectives of an enterprise. Distance education systems, because of the inherent complexity and interdependence of their parts require 'tighter' management than conventional educational institutions" (Snowden & Daniel, 1988, p. 339).

The need for "tighter" management is valid in the sense that the administrative and management units of distance education enterprises need to retain a higher degree of control and must possess a greater measure of knowledge pertaining to the inner workings of their organization than would normally be used in a non-distance education institution. The effective coordination of personnel at numerous levels and multiple sites requires excellent communication (Davis & Elliott, 1989; Verduin & Clark, 1991).

Distance education enterprises, not unlike the highly specialized and multifaceted equipment of which they make use, are organizations with myriad interconnected parts. Each part of the distance education organization relies on excellent communications and appropriate control over the various organizational components in much the same way that equipment requires the smooth interconnectedness of individual components in order to function at peak efficiency.

Evaluation

Due to the nature of their funding, the majority of distance education enterprises need to show a high degree of fiscal accountability (Snowden & Daniel, 1988; Murgatroyd & Woudstra, 1989). While price tags for the technology used in current distance education systems involving computers and telecommunications networks are declining, the entry level costs for such equipment is seldom below the six figure mark. Taxpayers, school boards, and state legislatures as well as funding agencies, both governmental and nongovernmental, expect to get the most from their funds (Dede, 1990; Miller, 1991; Jones, Simonson, Kemis & Sorensen, 1992; U.S. Congress, 1989).

Indeed, it would be highly irregular to find a distance education enterprise with external funding that did not require evidence that the monies were being effectively spent. In situations such as the Mass Learn Pike, where districts must buy-in to a system, it would be highly unusual for participating school districts not to be concerned with the fiscal accountability of the administration and management of the distance education system to which they subscribe (Miller, 1991; Davis & Elliott, 1989).

Evaluations can be conducted by the management and administrative arm of the distance education enterprise; however, evaluation should be done both internally and externally. Evaluative feedback provides the mechanism by which distance education enterprises can demonstrate their effectiveness and assure the quality of the learning experiences they provide (Miller, 1991; Moore, 1989; Murgatroyd & Woudstra, 1989; U.S. Congress, 1989). Reilly and Gulliver (1992) stated:

> The distance learning experience, particularly when it involves the use of technology, cannot necessarily be evaluated by the standard measures applied to classroom education, such as seat time, amount of face-to-face contact with the instructor, and the immediate availability of massive library collections and extensive laboratory facilities. In fact, since measurement of these inputs has produced little empirical evidence of the effectiveness of conventional classroom learning, using them as the base line to evaluate distance learning is problematic at best. (p. 12)

Whether evaluations are being conducted within the distance education organization or are facilitated by an external organization, the criteria by which the evaluation is conducted will need to change in order to reflect the different pedagogical assumptions implicit in distance education (Reilly & Gulliver, 1992).

Cooperation

As distance education enterprises grow to meet the needs of their students they become increasingly complex. Technology has seen to it that education is no longer the sole territory or property of any one system, institution or government body (Reilly & Gulliver, 1992; U. S. Congress, 1989). Information once thought of as accessible only to specific individuals or groups is now available to anyone with the equipment and desire to explore it.

The management and administrative bodies of many of today's distance enterprises reflect the increasingly complex nature of distance education's newer technologies. They are the product of a combination of organizations blended to form a single team with each player involved in specific aspects of the enterprise. It has recently become common practice for statewide networks to be the product of cooperation among state government, the education system (at whatever levels necessary to accomplish the stated goals of the program), and the business sector (IDEA, 1992; Hezel, 1991; U.S. Congress 1989). Among the chief issues of administration and management is the need for cooperation among and between those entities involved in distance education (Reilly & Gulliver, 1992; Hezel, 1991; Miller, 1991).

The Iowa Distance Education Alliance (IDEA), is an excellent example of the cooperative ideal. This project was the result of a collaborative effort of teachers and administrators from local school districts, the Iowa Department of Education, Iowa Public Television, the community colleges, the area education agencies, and the state's public (regent) and independent colleges and universities, and was supported by teaching and administrative professional organizations and the state's K–12 school boards (IDEA, 1992).

BEST COPY AVAILABLE

The Massachusetts Corporation for Educational Telecommunications (MCET) is similar in regard to the cooperation demonstrated by the business, labor, government, education, and health sectors. This body boasts a Star Schools project which was the result of a partnership involving 21 program providers (Miller, 1991).

The North Dakota Interactive Video Network, a statewide video conferencing system, became a reality during the 1990-91 academic year through the cooperative efforts of North Dakota's state legislature, university system, Department of Public Instruction, Information Services Division, USDA Rural Health Project, Educational Telecommunications Council (ETC), and local school districts (Tykwinski & Poulin, 1991).

Teacher Certification

When instruction is telecast across state boundaries, the issues of teacher certification and institution accreditation are a major concern (Hezel, 1991; Reilly & Guliver, 1992; U.S. Congress, 1989). Reilly and Gulliver (1992) listed the need for national accreditation, as called for by the Project on Assessing Long Distance Learning via Telecommunications (Project ALLTEL), among the chief administrative and management issues in distance education.

Where distance education courses cross state lines, the certification of teachers becomes an issue (Hezel, 1991). The delivery of distance education would be greatly facilitated if states could reach a consensus related to the minimum standards which are required of those instructors teaching via telecommunications technology (U.S. Congress, 1989; Reilly & Gulliver, 1992).

Personnel Issues

Successful operation of a distance education enterprise requires the knowledge, talents, and cooperation of a great number of individuals. John Dodd (1981) stated:

> In traditional teaching, not many people are involved in the teaching process. Teachers interact with students directly. Lecture notes are not professionally edited nor printed and distributed by others. The content of lecture notes is rarely scrutinized by academic colleagues. Teaching within the closed doors of the classroom is characteristically an individual, private activity.
>
> In distance teaching, communication between teachers and distance students is indirect. Many others—editors, designers, printers, broadcast producers, local tutor—can be involved in conveying to the student what the teacher originates. Teachers may work in production teams in which each member has an interest in what each other member is doing. With multiple learning materials being produced and many people collaborating in their production, the need to plan and coordinate staff activity is essential. (p. 85)

Instructors, students, and support staff must work in concert to produce quality distance education programming. Due to the interconnected nature of distance education enterprises, each individual is considered a valuable and integral member of the distance education team (Cyrs & Smith, 1990; Duning, Van Kekerix, & Zaborowski, 1993; Kaye & Rumble, 1981; Verduin & Clark, 1991).

For the purpose of this discussion, personnel issues are divided into three areas: (a) teachers, (b) students, and (c) support staff. The teacher section includes issues in the areas of professional and pre-professional preparation, compensation, and support. The student section includes adult and K–12 learners and is divided into the areas of selection, preparation, support, and testing and evaluation. Support staff is divided into technical, clerical, and educational categories, each with issues that must be resolved for effective and efficient functioning of distance education enterprises.

Teachers

A number of critical issues concerning distance education teachers must be addressed, for while the goal of educating students has not changed, the methods of instruction require a new vision. This section includes issues which, by their very nature, may have the most far-reaching impact, if for no other reason than it is the teacher who teaches.

The critical role of teachers in effective learning means that all must have training, preparation, and institutional support to successfully teach with technology. Few teachers have had either teacher education or field experiences that enable them to be effective distant teachers or successfully use technology in their own classroom. Although it is the technology that removes barriers and expands opportunities for learning, it is the teacher who teaches. In distance learning, teachers find that they are required to change their method of teaching and give more attention to advanced preparation, student interaction, visual materials, activities for independent study, and follow-up activities (U. S. Congress, 1989, p. 11).

In many distance education enterprises, the terms *facilitator* and *monitor* are used interchangeably, and in many cases, facilitator/monitors are certified teachers. It will prove helpful, therefore, to provide a defined role for these positions.

The role of the teacher is that of delivering instruction to the student using some form of technology. The teacher must be certified for the appropriate grade level, possess

BEST COPY AVAILABLE

the appropriate educational endorsements for specific subject matter, and have received training regarding effective distance education practices. The teacher is responsible for class content, design and delivery of instruction, degree of interactivity, and student evaluation at all receive sites as well as at the origination site. The role of the facilitator/monitor is to operate equipment, answer questions when necessary, distribute and collect those materials which the teacher has chosen, assist the course instructor when asked, and offer encouragement to remote site students.

Professional and pre-professional education

Effective distance education does not just happen any more than effective teachers just happen. Beaudoin (1990) stated that those faculty accustomed to more conventional teaching modes would have to acquire new skills to assume expanded roles, not only to teach distance learners, but also to organize instructional resources suitable in content and format for independent study. The nature of distance education (i.e., the separation of teacher and learner) necessitates changes in the methods used for instructional delivery. Further, each technology used to deliver instruction, whether it be correspondence or interactive telecommunications, requires that modifications and enhancements be made to the traditional face-to-face methods of teaching (Cyrs & Smith, 1990; Dede, 1990).

Collis, Veen, and De Vries (1993) predict that there will be a great need for teachers and students with telecommunications literacy. In order for distance teachers to be effective, they will need to participate in preparation programs designed to assist them in acquiring the necessary knowledge and skills required to function successfully in today's interactive distance education classrooms.

If those institutions which consider themselves to be at the forefront of preparing teachers for the classrooms of tomorrow wish to remain at the forefront of their profession, they will need to provide their preservice and inservice teachers with the tools necessary to excel at their craft. While a large number of excellent institutions have been educating preservice and inservice teachers for decades, little has been done in the actual preparation of teachers for distance education (U.S. Congress, 1989). Even less preparation has been undertaken in the area of interactive distance delivery systems which involve telecommunications (Moore, 1989; U.S. Congress, 1989; McGreal & Simand, 1992). As distance education becomes increasing prevalent throughout the world, the necessity of preparation in this area of the discipline will become more acute.

Iowa is an example of a state that made efforts to address the training issue at both the preservice and inservice levels through activities of the Teacher Education Alliance (TEA). The TEA produced a resource guidebook for the infusion of distance education into existing teacher education programs. The guidebook was designed to assist the state's teacher education professionals in preparing preservice teachers for success in the distance education classroom, and includes (a) a discussion of the philosophy of distance education, (b) an infusion model, (c) a sample matrix of the process, (d) a discussion of learner characteristics, (e) a discussion of the organization involved in distance teaching, (f) a section concerning evaluation, and (g) a section covering copyright considerations.

In addition, the TEA was involved in the presentation of staff development workshops for the state's teachers. The workshops covered (a) distance teaching methodology, (b) special curriculum needs, (c) design of instructional materials used in distance teaching, (d) development of curriculum implementation strategies, and (e) training and practice in the operation of the telecommunications equipment used to deliver instruction over the Iowa Communications Network (ICN), a two-way fully interactive fiber optic network connecting over 100 classrooms around the state.

In 1989, Mansfield University in Pennsylvania provided education students in their instructional technologies course the opportunity to use audiographics technology to teach students in Riverdale, North Dakota (U.S. Congress, 1989). The Curry School of Education at the University of Virginia created an electronic bulletin board system called Teacher-LINK to connect student teachers in the field with their university professors (Schrum, 1991). Such additions to student teaching and preservice teacher education offer students valuable experience in the capabilities and possibilities of distance teaching.

Many universities and colleges, New Mexico State University, Iowa State University, the University of Northern Iowa, North Dakota State University, and Iowa's Kirkwood Community College among them, offer workshops in teleteaching for their faculty. These institutions have also developed extensive resource guidebooks to be used in preparing their faculty for successful distance teaching experiences (Cyrs & Smith, 1990; Graf, 1993; Tykwinski & Poulin, 1991). Such guidebooks typically include sections on distance teaching philosophy and methodology, audience characteristics, course and materials design, and technology operation and capability.

Distance education is in a unique position to provide continuing education for teachers. Districts that provide funds for the continuing education of their teachers and have distance education infrastructures in place will be able to provide those additional credits in a more cost-effective manner. Travel time and expenses can be significantly reduced for teachers opting to take classes at a distance (Jurasek, 1993). Available courses are many and varied, offering educators across the nation opportunities to expand their knowledge base and create personal information networks.

Compensation

Distance teaching places increased demands on instructors' time. Distance teachers need additional planning time and must adapt current materials or develop new ones with a new set of criteria (U.S. Congress, 1989; Cyrs & Smith, 1990; Graf, 1993). Issues concerning the ratio of planning time to teaching time will bear certain scrutiny and require implementation of policies as increasing numbers of teachers begin delivering instruction to students at a distance.

Where school districts participate in multiple-site distance education delivery systems, issues pertaining to the sharing of teachers and their classes must be considered. Many of these issues are inherently local and need to be resolved between or among participating districts.

McGreal and Simand (1992) discussed the difficulties faced by Northern Ontario school districts attempting to use a cooperative model for distance education courses involving the sharing of services among several secondary schools. The authors pointed out that finding a mechanism for releasing the distance teachers, justifying small class sizes, and coordinating school calendars and teachers' schedules became very complicated. The authors found that when districts were attempting to form groups of more than three schools, problems increased exponentially. Their experience indicated that even groups of three schools were difficult to hold together.

Sachs, Wilkinson and Murphy (1993) described a highly successful instructor sharing agreement involving the campuses of the Virginia Community College System (VCCS). To facilitate the sharing of instructors, the VCCS campuses that received classes added each distance instructor as an adjunct faculty member. Each receive-site campus collected enrollment fees from their students and paid an instructional delivery fee to the origination-site campus. The origination-site campus was solely responsible for paying the distance instructor.

Questions of funding parity become evident as one moves from wealthy, influential districts, or those receiving substantial government funding, to those districts at the opposite end of the socioeconomic spectrum.

In this fee-for-service course delivery model, the users' fee justifies for the delivering board the outlay or resources. The receiving boards can participate in the courses as needed and opt only for courses that they cannot deliver locally. Unfortunately, it is often the smallest schools, those that need the courses most, that can least afford to pay for the courses; they need all their funds to maintain their in-school programs (McGreal & Simand, 1992).

Support

Moore (1989) pointed out that, in addition to appropriate training, it is crucial for professional distance educators to receive administrative support that reflects a belief in the importance of efforts to become effective teachers at a distance. He suggested that this could be accomplished by assurances of job security, salary and time allocations, and by including teachers in the areas of planning and decision making. Providing faculty with well maintained equipment and opportunities to become familiar with the technology, and staff development are equally important.

Depending on the availability of funds and the weight or importance assigned to distance education and its accompanying technology, money can be freed to defray all or part of the costs incurred by teachers who desire to participate in workshops and inservice programs concerning distance education (Willis, 1989). Policy needs to be designed to address equity of training opportunities for teachers already in the field.

Students

It is traditional to think of adult learners when distance education is mentioned (Garrison, 1989). Indeed, the greatest percentage of distance students have been adults. Whole institutions of higher learning such as Athabasca University in Canada or Great Britain's Open University are dedicated to providing distance education at the post-secondary level.

That tradition is changing. With the implementation of programs, such as the U.S. government's Star Schools Program, the vast possibilities of distance learning are being increasingly offered to K–12 student populations, as well as traditionally underserved populations (Miller, 1991; IDEA, 1993). High schools, middle schools, and even elementary schools are being offered opportunities to experience today's high technology distance education.

Selection

Traditionally, distance students have been adults who voluntarily sought further education for a variety of reasons (Garrison, 1989). These students enrolled in educational programs that fit their individual needs and situations. Entrance to these programs was determined by the individual institution offering the course work. However, distance education is becoming a growing method for providing increased professional development. Corporate students are frequently selected by their superiors for specific training.

One major change in distance education is in the influx of classes being offered for students in grades K–12. At the elementary and middle school levels, distance education,

BEST COPY AVAILABLE

primarily in the form of telecommunications, is used as a method of curriculum enrichment. However, the impetus for distance learning at the secondary level is due primarily to the needs of small rural school districts (U.S. Congress, 1989). In some cases, students enroll in courses that their own districts are unable to offer to meet graduation requirements. Other students opt to enroll in course work because they possess an interest in the subject or need the class for a college entrance requirement (Corporation for Public Broadcasting, 1993).

In many instances, high school level students have been selected to attend distance classes by virtue of their high academic ability and specific learner characteristics, as is often the case with those students who have been labeled talented and gifted (U.S. Congress, 1989). At the other end of the spectrum are federally funded projects, such as the Star Schools Program, whose goals include serving students and schools that are considered educationally disadvantaged or traditionally underserved (U.S. Congress, 1989; IDEA, 1993; Miller, 1991; Rumble, 1992).

Preparation

Today's distance students can no longer be characterized by the sweeping generalities of the past. In an educational climate permeated by individualization, distance education is opening opportunities to whole classrooms of students.

Fiber optic technology makes it possible to place a teacher in real time, both visually and auditorially, within the receive-site classroom; a technique referred to by one author as "the next best thing to being there." Issues mentioned by Holmberg (1986) concerning the amount of individualization, student autonomy, and opportunity for interaction become moot with the instructor "in-site." However, new issues arise to take their place.

Among those issues is the provision of student orientation to the distance education experience (Moore, 1989). Students benefit from being informed about rules and procedures for their distance class and the expectations of their instructor. Programs and personnel must exist that can explain and demonstrate the distance education technology in those classrooms where some pieces of equipment, such as microphones, must be operated by students.

Support

Appropriately designed and maintained support systems are required for successful distance education enterprises (Moore, 1989). Methods for accessing out-of-class materials, such as those provided by individual school media centers or local libraries, should be taken into consideration. To provide comparable experiences to those in the traditional class, distance instructors teaching laboratory classes, such as photography or computer programming, need to assist students in making the necessary arrangements for use of local facilities. If facilities are not locally available, arrangements should be made for student use of the facilities at the origination site.

Accessibility of the distance instructor is an important support issue. Students need to be apprised of the ways they can reach their teachers (Duning, Van Kekerix, & Zaborowski, 1993; Moore, 1989). This is usually done through the use of long distance phone calls or fax machine; however, a block of time on the system could be provided at each site when the instructor and student could "meet" via the technology. Trips by the instructor to the distant site as well as trips by the student to visit the instructor at the origination site are also possibilities. Instructors also need to provide their distance students with timely feedback concerning assignments and tests. Students must be constantly provided with opportunities to interact with their instructor and fellow students at participating sites.

Distance students are separated from their instructor, classmates and the other personnel often associated with learning institutions. When problems occur, feelings of separation may become heightened. It is necessary, therefore, to provide distance students with counseling services that meet the special needs of distance students (Moore, 1989; U.S. Congress, 1989; Rumble, 1992).

Testing and evaluation

The term evaluation means many things to many people. In one form or another, evaluation is used in every kind of formal education (Verduin & Clark, 1991). It is important for students to participate in the evaluative process both in terms of their own progress and the success of the programs in which they participate.

Research shows that participant evaluation is one of the best indicators of the effectiveness of a program (Sachs, 1993). Student feedback can provide valuable data on which to base decisions regarding course effectiveness (Sachs, 1993; Johnson, 1988; Martin & Rainey, 1993). Once analyzed, assessments of student attitudes and perceptions can be used to identify and change those areas of a program that are found to produce negative reactions (Biner, 1993; Egan, Welch, Page & Sebastian, 1992).

Cyrs and Smith (1990) indicate that the purpose of student assessment, either through observable performance, product development, or traditional paper and pencil tests, is to provide data to the instructor indicating to what degree the performance objectives have been mastered. Individual testing over course material is an important diagnostic tool for the student and the teacher. Students should be given timely feedback on the examinations they take in their distance classes (Duning, Van Kekerix, & Zaborowski, 1993).

Support Staff

Distance education enterprises are characterized by the integration of many parts working toward a common goal. Support personnel (clerical, technical, and educational), are a vital link between teacher and student. Support staff provide a great deal of service to distance students.

Technical personnel

The focus on advanced telecommunications systems as the method of delivery of distance education necessitates a staff of well trained individuals. In some distance classrooms, the technology that delivers the picture and sound to the remote sites is run by a technician rather than the distance teacher. School district remote sites with large investments in advanced technology require the services of local technical support personnel.

Clerical personnel

Clerical personnel handle enrollment and registration of students, process requests for equipment repair and acquisition, handle collection of tuition, maintain lines of communication between and among the various teams involved in distance education enterprises, and frequently assist in the replication and distribution of course materials. These individuals have a great deal of contact with distance students and handle routine student transactions on a daily basis. Because support staff provides a critical link between the student and the distance education enterprise, its members should possess a friendly and helpful attitude.

Educational personnel

A number of issues surround the role of the facilitator/monitor. Policies differ from state to state as to whether or not the facilitator/monitor must be present at the receive site during the entire class period or simply accessible to students if and when they require assistance. States also vary widely on the specific qualifications required for this position. The necessity for current teaching certification for facilitators is directly affected by the way in which individual states interpret their policies governing the use of distance site facilitators. Training in effective distance education practices may also be required depending upon the state.

The state of Washington requires classroom facilitators to be certified in the subject being taught. States such as Alaska and Oregon require the presence of certified teachers; however, endorsement for specific subject matter is not considered necessary (US. Congress 1989). The most current revision in the Iowa Code, Chapter 15, "Use of Telecommunication for Instruction by Schools" 281-15.5(256) reads,

> A teacher appropriately licensed and endorsed for the educational level and content area being taught shall be present and responsible for the instructional program at the receiving site if a presenter of material transmitted via telecommunications is not an appropriately licensed and endorsed teacher for the educational level and content area. If a presenter of material transmitted via telecommunications is an appropriately licensed and endorsed teacher for the educational level and content area, a supervising teacher, or aide to whom a supervising teacher is readily available for consultation, shall supervise and monitor the curriculum and students, and be readily accessible to the students. Prior to being assigned initially to deliver instruction via telecommunications, a teacher shall receive training regarding effective practices which enhance learning by telecommunications. (Iowa Department of Education, 1990)

Programming Issues

Courses

Distance education courses are designed to accommodate vast and varied segments of the population including business, professional organizations, government, and education. Courses are offered in a multitude of subjects across the curriculum and more recently across grade levels, spanning everything from preschool to post-secondary education. Programming is available in every possible medium from print to live two-way full motion interactive video. Classes are available locally, regionally, nationally, and internationally.

The issue is no longer so much a profound concern over programming subject availability, accessibility, or cost, but one of quality. Hezel (1991) points to educational value as being an important consideration in a program or course. In looking for programming to suit the needs of a particular group of learners it becomes imperative to look beyond the titles and price tags. School districts have little money to waste on programming that is pedagogically unsound, poorly designed, or unsuitable to their specific needs.

Miller (1991), discussing distance education, states that there are no national guidelines or articulated standards for academic courses, and further that there are no generally accepted criteria or review panels for instructional design and delivery. Such a lack of policy concerning distance education programming surrounds this area of concern with the distinct air of caveat emptor.

Course design and curriculum development are critical to any educational endeavor, but the special parameters presented by distance education make this area particularly

BEST COPY AVAILABLE

important (Moore, 1989; Graf, 1993). In a large dedicated distance education enterprise, the personnel required for course and curriculum design can be numerous. Verduin and Clark (1991) stated,

> The development of learning materials and media is particularly critical in distance education and could be approached by a team with a good degree of sophistication. The development team should include content specialists (academics); instructional designers; writers and editors; media specialists, if different from designers; and specialists in adult learner behavior and curriculum development. An interactive team approach can minimize the production-line concept, in which people add bits and pieces to courses as they come down the line. Course development is a highly skilled area of expertise and should be treated as such to ensure quality control of the program. (p. 177)

Depending upon the size of the distance education enterprise and the level at which the course is taught, the content of the material and the extent of the production will vary. Dedicated distance universities such as Great Britain's Open University require vast design and production services. Programming originating from a single instructor in an Iowa high school may simply need to be adapted to the specific delivery format which will be used.

There are currently a number of privately and commercially produced shows available. Programs produced for the lower elementary level, like "Reading Rainbow," delight students and teachers alike. Current events programming such as The Discovery Channel's "Assignment Discovery," Cable News Network's (CNN) "CNN Newsroom," and Whittle Communication's "Channel One" provide older students with excellent news coverage. Such programming is not without its pitfalls however. In the case of "Channel One," there is advertising to consider and this has become a controversial issue in the educational community (U.S. Congress, 1989; Miller 1991).

Intellectual property rights of faculty and questions concerning faculty royalties will need to be addressed (Hezel, 1991; Miller, 1991). Copyright policies must be fashioned that are equitable to the developer without pricing the product beyond the means of the distance education enterprise. Marketing the instructional programming available from various distance institutions will need to be addressed (Moore 1989; Rumble, 1992).

Programming control is a vital issue. Miller (1991) points to MCET's Star Schools proposal as an example of making an attempt to accommodate local autonomy by presenting an array of available programs and technologies and assisting local schools in making the most suitable choices. It is an important consideration to local communities to be able to retain control over the programming they use (Miller, 1991; IDEA, 1993; McGreal & Simand, 1992).

Enrichment

One of the advantages of distance education, particularly in the area of telecommunications, is the many ways it can be used to enrich the curriculum. Through the use of current technology it is possible to bring experiences into the classroom that were only dreamed of a few years ago.

Children in a sixth grade social studies class writing to pen-pals in a foreign country are able to converse with their fellow students face-to-face via telecommunications. Students in a high school civics class studying famous speeches from national political conventions could talk with individuals who have delivered such addresses. Students in a foreign language classroom can engage in lively conversation directly with their counterparts in a classroom in Spain. Student teachers from several universities across the nation can gather to discuss their teaching experiences. Band students can participate in instrumental music lessons with experts in the fields of brass, reeds and percussion.

Facilities Issues

Equipment and Maintenance

Technology that is new today is old tomorrow. Computer and telecommunications equipment undergo changes in capability with such speed that some of the technology becomes obsolete almost before it is operational (Miller, 1991). When the concerns of obsolescence are coupled with the rate at which technology drops in price and the issues of which technology to buy and how much should be purchased, it is clear that there are difficult questions for distance enterprises and school districts to answer (Dede, 1990; U.S. Congress, 1989).

The amount and sophistication of the equipment needed for a distance education enterprise depends on the chosen method of delivery, or the type of system to which one subscribes. Each enterprise is organized and funded differently. Equity in the distribution of funding is a concern (McGreal & Simand, 1992). The purchase of equipment is usually centrally done so that equipment can be purchased in volume, which is more cost effective.

Space for distance classrooms becomes an issue particularly in overcrowded districts. Lack of an adequate site for a distance classroom could mean lack of participation in a distance project and would have to be carefully weighed against the commotion created by displacing and subsequently redistributing students in order to gain the required space. Consideration must be given to equipping interactive distance classrooms in the most unobtrusive way possible. The learning, not the technology, should be the primary focus of what transpires in the distance education classroom (Miller, 1991).

Class size is an issue that can affect course offerings. Some districts simply cannot afford to commit a classroom or the services of a distance teacher for one period each day for an entire semester for a very small number of students (McGreal & Simand, 1992). Conversely, extremely large numbers of students as well as large numbers of sites make distance classes undesirable because the amount of interactivity is severely curtailed (U.S. Congress, 1989).

In an effort to reach out to community interests and make distance education available to populations which are not a part of the traditional academic setting, distance sites located in school buildings must remain accessible during the hours when classes are not in session. Conversely, personnel in charge of those distance sites that are located in places other than the traditional educational setting need to be sensitive to the needs of the educational community. Clearly, such awareness can help build invaluable partnerships that will enrich all involved.

Maintenance of interactive distance classrooms is generally taken for granted, but left undone, this aspect of a distance classroom could well be the most glaring weakness. The majority of complaints from distance students concerning telecourses relate to the quality of the transmissions (Cyrs & Smith, 1990; Jurasek, 1993).

Scheduling

Assessments of distance students' needs can help determine which courses to schedule during a semester; however, when classes are telecast to multiple sites, the problems associated with scheduling multiply rapidly. Schedules need to be synchronized between and among participating districts not only in regard to their daily schedule but the yearly calendar as well (McGreal & Siman, 1992).

Policy must be formulated regarding issues of scheduling conflicts. Criteria for resolving those conflicts should be established and a position among the personnel of the distance enterprise should be designated to make those kinds of decisions. In Iowa, when scheduling conflicts on the Iowa Communications Network cannot be resolved at the regional level, the matter is turned over to the Narrowcast Advisory Committee (NAC), which renders a solution.

Summary

As distance education enterprises break through the barriers of traditional classroom walls they encounter new barriers with which they must contend. If distance classrooms are to become places of learning excellence, the issues that erect new barriers will need to be addressed. Policy issues can be summarized as follows:

- To be successful distance educators, preservice and inservice teachers require training in distance education techniques.
- Delivery of courses spanning state boundaries will be greatly facilitated by a nationally agreed upon set of standards.
- Administrative and fiscal support for distance teachers is required and can be demonstrated by providing for staff development and increased planning time, inclusion in the policy planning procedure, job security, and well maintained equipment.
- Inequities in funding of programs for staff development and student programming must be addressed.
- Sharing of instructors and scheduling of courses between or among school systems requires meticulous planning.
- Students must be provided with support services including orientation and counseling appropriate to their grade level and course of study.
- Testing and evaluation of both student performance and program effectiveness are necessary, and such feedback should be expeditious.
- Programming, while widely available in many formats, curriculum areas, and grade levels, does not necessarily meet a minimum standard of excellence and should be judged accordingly.
- There is a plethora of technologies available for the delivery of distance education. However, compatibility, cost, and longevity of equipment require careful consideration and planning prior to purchase and installation.

References

Beaudoin, M. (1990). The instructor's changing role in distance education. The American Journal of Distance Education, 4(2), 22–29.

Biner, P. M. (1993). The development of an instrument to measure student attitudes toward televised courses. The American Journal of Distance Education, 7(1), 62–73.

Collis, B., Veen, W., & De Vries, P. (1993). Preparing for an interconnected future: Policy options for telecommunications in education. Educational Technology, 33(1), 17–24.

Corporation for Public Broadcasting. (1993). Lifelines of learning: Distance education an America's rural schools. Congressional Report Pub. L. 102–356.

Cyrs, T. E., & Smith, F. A. (1990). Teleclass teaching: A resource guide. Las Cruces, NM: New Mexico State University.

Davis, S., & Elliott, C. S. (1989). Whose job is teleconference reception? The American Journal of Distance Education, 3(3), 22–35.

Dede, C. (1990). The evolution of distance learning: Technology-mediated interactive learning. Journal of Research on Computing in Education, 22(3), 247–264.

Dodd, J. (1981). In A. Kaye and G. Rumble (Eds.), Distance teaching for higher and adult education. London: Croom Helm.

Duning, B. S., Van Kekerix, M. J., & Zaborowski, L. M. (1993). Reaching learners through telecommunications: Management and leadership strategies for higher education. San Francisco: Jossey-Bass.

Egan, M. W., Welch, M., Page, B., & Sebastian, J. (1992). Learners' perceptions of instructional delivery systems: Conventional and television. The American Journal of Distance Education, 6(2), 72–80.

Garrison, D. R. (1989). Understanding distance education: A framework for the future. London: Routledge.

Graf, D. (1993). Teleteaching: Distance education planning, techniques, & tips. Ames, IA: Media Resources Center, Iowa State University.

Hezel, R. T. (1991). Statewide planning for telecommunications in education: Some trends and issues. Tech Trends, 36(5), 17–20.

Holmberg, B. (1986). Growth and structure of distance education. London: Croom Helm.

Iowa Department of Education. (May 4, 1990). Iowa Code subsection 256.7(9). Ch. 15, "Use of Telecommunications for Instruction by Schools," 281-15.5(256).

Iowa Distance Education Alliance (IDEA). (1992, July). Partnerships for interactive learning through telecommunications in Iowa's secondary schools (84,203B Star Schools-Special Statewide Network). Johnston, IA: Iowa Public Television.

Johnson, A. (1988). Attitudes of high school students in small rural schools toward satellite instruction. Unpublished master's thesis, Iowa State University, Ames, IA.

Jones, J. I., Simonson, M. R., Kemis, M., & Sorensen, C. (1992). Distance education: A cost analysis. (Available from the Research Institute for Studies in Education, Iowa State University, Ames, IA).

Jurasek, K. A. (1993). Distance education via compressed video: an evaluation. Unpublished master's thesis, Iowa State University, Ames, IA.

Kaye, A., & Rumble, G. (1981). Distance teaching for higher and adult education. London: Croom Helm.

Martin, E. D., & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. The American Journal of Distance Education, 7(1), 54–61.

McGreal, R., & Simand, B. (1992). Problems in introducing distance education into northern Ontario secondary schools. The American Journal of Distance Education, 6(1), 51–78.

Miller, I. (1991). MCET: Creating the infrastructure. The Annals of the American Academy of Political and Social Science, 92–106.

Moore, M. G. (1989). Effects of distance learning: A summary of the literature. Washington DC: Office of Technology Assessment, Congress of the United States.

Murgatroyd, S., & Woudstra, A. (1989). Issues in the management of distance education. The American Journal of Distance Education, 3(1), 4–19.

Olcott, D. J., Jr. (1992). Policy issues in statewide delivery of university programs by telecommunications. The American Journal of Distance Education, 6(1), 14–26.

Reilly, K. P., & Gulliver, K. M. (1992). Interstate authorization of distance higher education via telecommunication: The developing national consensus in policy and practice. The American Journal of Distance Education, 6(2), 3–16.

Rumble, G. (1992). The management of distance learning systems. Paris: UNESCO: International Institute for Educational Planning.

Sachs, S. G. (1993). Supporting compressed video. In B.T. Hakes, S.G. Sachs, C.B. Box, & J. Cochenour (Eds.), Compressed video: Operations and applications (pp. 180–198). USA: The Association for Educational Communication and Technology.

Sachs, S. G., Wilkinson, T., & Murphy, P. N. (1993). Sharing instructors in Virginia: Improving access to distance education. Tech Trends, 38(1), 22–24.

Schrum, L. (1991). Teacher education goes online. Educational Leadership, 49(3), 39–41.

Snowden, B. L., & Daniel, J. S. (1988). The economics and management of small post-secondary distance education systems. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 398–424). New York: Routledge.

Tykwinski, J. R., & Poulin, R. C. (1991). North Dakota interactive video network: A practical guide to teleconferencing and distance education. Bismarck: The North Dakota University System.

U. S. Congress, Office of Technology Assessment. (1989). Linking for learning: A new course for education. (OTA-SET-430). Washington, DC: U. S. Government Printing Office.

Verduin, J. R., Jr., & Clark, T. A. (1991). Distance education: The foundations of effective practice. San Francisco: Jossey-Bass.

Willis, B. (1989). Distance education and academic policy: Making it all fit. Tech Trends, 34(3), 33–34.

Distance Education:
A Selected Bibliography

Ackermann, E. (1995). Learning to use the Internet, Wilsonville, Oregon: Franklin, Beedle and Associates Inc.

Acri, A. (1986). Microwave systems for education. EITV, 18(11), 28–29.

Ahern, T.C., & Repman, J. (1994). The effects of technology on online education. Journal of Research on Computing in Education, 26(4), 537–546.

Albright, M. (1988). A conceptual framework for the design and delivery of a university-level credit course by communications satellite. Unpublished doctoral dissertation. Iowa State University, Ames, IA.

Arendt, J. D., & Warriner-Burke, H. P. (1990). Teaching all students: Reaching and teaching students of varying abilities. Foreign Language Annals, 23(5), 445–452.

Azarmsa, R. (1987). Teleconferencing: How to be a successful host. Tech Trends, 32(9), 19–23.

Bääth, J. A. (1979). Correspondence education in the light of a number of contemporary teaching models. Malmo: Hermods.

Bääth, J. A. (1980). Postal two-way communication in correspondence education. An empirical investigation. (ERIC Document Reproduction Service No. ED 224 466)

Baggaley, J. (1973). Analyzing TV presentation techniques for educational effectiveness. Educational Broadcasting International, 6(1), 17–21.

Badham, R. & Mathews, J. (1989). The new production systems debate. Labour and Industry, 2(2), 194–246.

Baker, M. H. (1995). Distance teaching with interactive television: Strategies that promote interaction with remote-site students. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 107–115). Ames, Iowa: Teacher Education Alliance.

Barker, B. O. (1985). Maintaining and/or expanding curriculum offerings in small and rural high schools. (ERIC Document Reproduction Service No. ED 261 849)

Barker, B. O. (1986). Technological innovations impacting instruction in rural and small schools. (ERIC Document Reproduction Service No. ED 274 498)

Barker, B. O. (1987a). An evaluation of interactive satellite television as a delivery system for high school instruction. Paper presented at the Annual Meeting of the Southwest Education Research Association. Dallas, TX. (ERIC Document Reproduction Service No. ED 277 543)

Barker, B. O. (1987b). Interactive distance learning technologies for rural and small schools: A resource guide; and ERIC mini-review. (ERIC Document Reproduction Service No. ED 286 698)

Barker, B. O. (1987c). Interactive learning by satellite. Clearing House, 61(9), 13–16.

Barker, B. O. (1987d). Using interactive technologies to increase course offerings in small and rural schools. (ERIC Document Reproduction Service No. ED 279 465)

Barker, B. O. (1988). Satellite TV programs for rural and small schools. Rural Educator, 8(1), 1–4.

Barker, B. O. (1990). Distance education in rural schools: Advantages and disadvantages. Rural Educator, 12(1), 4–7.

Barker, B. O. (1992). The distance education handbook: An administrator's guide for rural and remote schools. ERIC Clearinghouse on Rural Education and Small Schools. Charleston, WV: Appalachia Educational Laboratory.

BEST COPY AVAILABLE

Barker, B. O., Frisbie, A. G., & Patrick, K. R. (1989). Broadening the definition of distance education in light of the new telecommunications technologies. The American Journal of Distance Education, 3(1), 20–29.

Barker, B. O., & Goodwin, R. D. (1992). Audiographics: Linking remote classrooms. The Computing Teacher, 19(7), 11–15.

Barker, B. O., & Logan, S. (1985). Small high schools curricula: Alternative delivery systems for meeting essential elements. (ERIC Document Reproduction Service No. ED 252 371)

Barker, B. O., & Platten, M. R. (1988). Student perceptions on the effectiveness of college credit courses taught via satellite. The American Journal of Distance Education, 2(2), 44–50.

Barker, K. (1986). Dilemmas at a distance. Assessment and Evaluation in Higher Education, 11(3), 219–230.

Barrington, H. (1974). Instruction by TV: Two presentations compared. Educational Research, 14(3), 187–190.

Barron, D. D. (1987). Alternative delivery of library and information science symposium. Journal of Education for Library and Information Science, 27, 219–294.

Barron, D. D. (1989). Distance education: Removing barriers to knowledge. School Library Journal, 35(15), 28–33.

Barron, D. D. (1990). The use of distance education in United States library and information science: History and current perspectives. Education for Information, 8(4), 325–339.

Barry, M. & Runyan, G. B. (1995). A review of distance-learning studies in the U. S. military. The American Journal of Distance Education, 9(3), 37–47.

Baruch, J. J. (1986). Interactive television: A mass medium for individuals. (ERIC Document Reproduction Service No. ED 057 609)

Bates, A. W., & Prescott, W. (1988). Language teaching, distance education and the new IET papers on broadcasting. (ERIC Document Reproduction Service No. ED 318 426)

Bates, A. W. (1982). Trends in the use of audio visual media in distance education systems. In J. S. Daniel, M. A. Stroud, & J. R. Thompson, Learning at a Distance. A World Perspective (pp. 8–15). Edmonton: Athabasca University/ ICCE.

Bates, A. W. (1984). The role of technology in distance education. London: Croom Helm.

Bates, A. W. (1987). Technology for distance education: A 10 year perspective. Paper presented to the Long Term Review Group of the European Association of Distance Teaching Universities, Heerlen, The Netherlands. (ERIC Document Reproduction Service No. ED 318 421)

Bates, A. W. (1990). Interactivity as a criterion for media selection in distance education. Paper presented at the annual conference of the Asian Association of Open Universities, Jakarta, Indonesia. (ERIC Document Reproduction Service No. ED 329 245)

Batey, A., & Cowell, R. N. (1986). Distance education: An overview. Portland, OR: Northwest Regional Educational Lab. (ERIC Document Reproduction Service No. ED 278 519)

Bauer, J. W., & Rezabek, L. L. (1992). The effects of two-way visual contact on student verbal interactions during teleconferenced instruction. (ERIC Document Reproduction Service No. ED 347 972)

Baur, W. S. (1971). Interactive television: Prospects for two-way services on cable. (ERIC Document Reproduction Service No. ED 067 125)

Baynton, M. (1992). Dimensions of "control" in distance education: A factor analysis. The American Journal of Distance Education, 6(2), 17–30.

Beare, P. L. (1989). The comparative effectiveness of videotape, audiotape, and telelecture in delivering continuing teacher education. The American Journal of Distance Education, 3(2), 57–66.

Beaudoin, M. (1990). The instructor's changing role in distance education. The American Journal of Distance Education, 4(2), 21–29.

Benko de Rotaeche, A. (1987). The influence of an instructional design upon the learning of distance education students in Venezuela (ZIFF Papiere 66). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 292 462)

Benson, G. M. (1988). Rural schools tap into high tech learning. PTA Today, 13(8), 18–21.

BEST COPY AVAILABLE

Benson, G. M., & Hirschen, W. (1987, November). Long-distance learning: New windows for technology. Principal, 67, 18–20.

Bernard, R. M., & Naidu, S. (1990). Enhancing interpersonal communication in distance education: Can "voice-mail" help? Educational and Training Technology International, 27(3), 293–300.

Bernt, F. L., & Bugbee, A. C. (1993). Study practices and attitudes related to academic success in a distance learning programme. Distance Education, 14(1), 97–112.

Billings, D. M. (1988). A conceptual model of correspondence course completion. The American Journal of Distance Education, 2(2), 23–35.

Biner, P. M. (1993). The development of an instrument to measure student attitudes toward televised courses. The American Journal of Distance Education, 7(1), 62–73.

Biner, P. M., Bink, M. L., Huffman, M. L., & Dean, R. S. (1995). Personality characteristics differentiating and predicting the achievement of televised-course students and traditional-course students. The American Journal of Distance Education, 9(2), 46-60.

Biner, P. M., Dean, R. S., & Mellinger, A. E. (1994). Factors underlying distance learner satisfaction with televised college-level courses. The American Journal of Distance Education, 8(1), 60–71.

Birchall, D. W. (1990). Third generation distance learning. Journal of European Industrial Training, 14(7), 17–20.

Bisesi, M., & Felder, B. D. (1986). Interactive television. New Directions for Higher Education, 56(4), 37–45.

Bledinbach, J. M., & Chenette, E. R. (1985). Uses of instructional television in engineering education in the United States. Washington, DC: American Society for Engineering Education.

Block, A. L. (1990). Combining academic and vocational education. Wisconsin Vocational Educator, 14(2), 8–9.

Blumenstyk, G. (1991, October). Many attempts at distance learning are impeded by unforseen political and financial problems. The Chronicle of Higher Education, 38, A23–A25.

Boehnker, D. (1986). UNM sets its course for ITFS. EITV, 18(9), 31–33.

Bond, S. L. (1987). Telecommunications-based distance learning: A guide for local educators (Research Report). Research Triangle Park, NC: Southeastern Educational Improvement Lab. (ERIC Document Reproduction Service No. ED 287 474)

Bostick, R. N. (1987). Why use instructional television? Tech Trends, 32(9), 32–33.

Bouton, R. A. (1989). A model vocational education laboratory distance learning system: Final report (Project Number: 99420007-57). Austin, TX: Extension Instruction and Materials Center.

Bowman, M. (1986). Televideo system signals opportunities for students. EITV, 18(11), 23–25.

Bowser, D., & Race, K. (1991). Orientation for distance education students: What is its worth? Distance Education, 12(1), 109–122.

Bradshaw, D., & Brown, P. (1989). The promise of distance learning: Policy briefs number eight. San Francisco, CA: Far West Laboratory for Educational Research and Development. (ERIC Document Reproduction Service No. ED 323 903)

Bradshaw, D. H., & Desser, K. (1990). Audiographics distance learning: A resource handbook. San Francisco, CA: Far West Laboratory for Educational Research and Development. (ERIC Document Reproduction Service No. ED 328 384)

Bramble, W. J., & Martin, B. L. (1995). The Florida teletraining project: Military training via two-way compressed video. The American Journal of Distance Education, 9(1), 6–26.

Briscoe, K. G., & Brown, F. (1986). Sowing technology in the cornfields of Iowa. Educational Records, 67(1), 21–23.

Brown, C. E. (1988). The live video teleconference in distance learning. Lifelong Learning, 11(5), 8–10.

Bruder, I. (1989). Distance learning: What's holding back this boundless delivery system? Electronic Learning, 8(6), 30–35.

Bruder, I. (1991, Novermber/December). A guide to distance learning. Electronic Learning, 11, 20–23.

Bruning, R., Landis, M., Hoffman, E., & Grosskopf, K. (1993). Perspectives on an interactive satellite-based Japanese language course. The American Journal of Distance Education, 7(3), 22–38.

Buckland, M., & Dye, C. (1991). The development of electronic distance education delivery systems in the United States. Recurring and emerging themes in history and philosophy of education. (ERIC Document Reproduction Service No. ED 345 713)

Burge, E., & Lenskyj, H. (1990). Women studying in distance education: Issues and principles. Journal of Distance Education, 5(1), 20–37.

Burge, E. J., & Howard, J. L. (1990). Audioconferencing in graduate education: A case study. The American Journal of Distance Education, 4(2), 3–13.

Burke, M. A. (1990). Designing the K–12 library media program to facilitate distance education. Journal of Educational Technology Systems, 19(2), 115–127.

Burnhan, B. R., & Seamons, R. A. (1987, October). Exploring the landscape of electronic distance education. Lifelong Learning, 11, 8–11.

Burns, R. W. (1976). Instructional television, interaction and learning objectives. Educational Technology, 16(5), 44–49.

Campion, M. & Renner, W. (1992) . The supposed demise of fordism–Implications for distance and higher education. Distance Education, 13(1), 7–28.

Campion, M. (1995). The supposed demise of bureaucracy: Implications for distance education and open learning–more on the post-Fordism debate. Distance Education, 16(2), 192–216.

Carey, J. (1978). A primer on interactive television. Journal of the University Film Association, 30(2), 35–39.

Carl, D. L. (1991). Electronic distance learning: Positives outweigh negatives. T.H.E. Journal, 18, 67–70.

Carl, D. R. (1976). Instructional development in instructional television. Educational Technology, 16(5), 10–24.

Center for Educational Development—New Mexico State University. (1987). Teaching in the teleclassroom. Las Cruces, NM: New Mexico State University.

Charles, J. (1976). Interactive television: Use your imagination and help students learn. Audiovisual Instruction, 21(5), 23–25.

Cheng, H. C., Lehman, J., & Armstrong, P. (1991). Comparison of performance and attitude in traditional and computer conferencing classes. The American Journal of Distance Education, 5(3), 51–64.

Chu, G., and Schramm, W. (1975). Learning from television: What the research says. (ERIC Document Reproduction Service No. ED 109 985)

Clark, G. C. (1989). Distance education in United States schools. Computing Teacher, 16(6), 7–11.

Clark, C. (1988). Telecommunications is here and now. Computing Teacher, 15(6), 24–25.

Clark, R. E. (1983). Reconsidering research on learning from media. Review of Educational Research, 53(4), 445–459.

Clark, R. E. (1989). Evaluating distance learning technology. Washington, DC: U. S. Congress, Office of Technology Assessment. (ERIC Document Reproduction Service No. ED 325 097)

Clark, R. E. (1994). Media will never influence learning. Educational Technology Research and Development, 42(2), 21–29.

Clifford, R. (1990). Foreign language and distance education: The next best thing to being there. Washington, DC: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 327 066)

Coggins, C. C. (1988). Preferred learning styles and their impact on completion of external degree programs. The American Journal of Distance Education, 2(1), 25–37.

Coldeway, D. O. (1982). Recent research in distance learning. In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a Distance. A World Perspective (pp. 29–37). Edmonton: Athabasca University/ICCE.

Coldeway, D. O. (1988). Methodological issues in distance education research. The American Journal of Distance Education, 2(3), 45–54.

Coldeway, D. (1991). Patterns of behavior in individualized distance education courses. Research in Distance Education, 3(4), 6–10.

Collins, J. H. (Ed.). (1988a). Proceedings of the international conference on technology and education, Edinburgh, Scotland, volume 1. Fort Worth, TX: Tandy Corporation. (ERIC Document Reproduction Service No. ED 316 181)

Collins, J. H. (Ed.). (1988b). Proceedings of the international conference on technology and education, Edinburgh, Scotland, volume 2. Fort Worth, TX: Tandy Corporation. (ERIC Document Reproduction Service No. ED 316 182)

Collis, B., Veen, W., & De Vries, P. (1993). Preparing for an interconnected future: Policy options for telecommunications in education. Educational Technology, 33(1), 17–24.

COMBASE. (1987). Using technology to serve rural audiences: The John Wood model. Quincy, IL: John Wood Community College.

Combes, P., & Tiffin, J. (1978). TV production for education: A systems approach. New York: Focal Press Limited.

Cookson, P. S. (1989). Research on learners and learning in distance education: A review. The American Journal of Distance Education, 3(2), 22–34.

Corporation for Public Broadcasting. (1993). Lifelines of learning: Distance education an America's rural schools. Congressional Report Pub. L. 102–356.

Cropley, A., & Kahl, T. N. (1983). Distance education and distance learning: Some psychological considerations. Distance Education, 4(1), 27–39.

Crow, M. L. (1977). Teaching on television. Arlington, TX: Faculty Development Resource Center, University of Texas at Arlington.

Curtis, J. A., & Biedenbach, J. M. (1979). Educational telecommunications delivery systems. Washington, DC: The American Society for Engineering Education.

Cutright, P., & Girrard, K. M. (1991). Remote access to CD-ROM for the distant learner. CD-ROM Professional, 4(6), 80–82.

Cyrs, T., & Smith, F. (1988). Faculty training for television teaching: State of the art. Las Cruces, NM: New Mexico State University.

Cyrs, T. E., & Smith, F. A. (1990). Teleclass teaching: A resource guide. Las Cruces, NM: New Mexico State University.

Dalton, D. W. (1987). Some advantages and disadvantages of narrowcast television: One instructor's experience. Educational Technology, 27(1), 42–44.

Daniel, J. S., Stroud, M.S., & Thompson, J. R. (Eds.). (1982). Learning at a distance: A world perspective. Edmonton: Athabasca University, International Council for Distance Education. (ERIC Document Reproduction Service No. ED 222 635)

Data, S. R. (1986). IHETS: Telecommunications aimed at students. EITV, 18(2), 44–45.

Davis, S., & Elliott, C. S. (1989). Whose job is teleconference reception? The American Journal of Distance Education, 3(3), 22–35.

DeChenne, J. A. (1981). Talkback television: A successful statewide instructional distribution system. Journal of Educational Technology Systems, 10(3), 293–296.

Dede, C. (1990). The evolution of distance learning: Technology-mediated interactive learning. Journal of Research on Computing in Education, 22(3), 247–264.

Delling, R. M. (1987). Towards a theory of distance education, ICDE Bulletin, 13,21–25.

Demmert, J. P., & Wilke, J. L. (1982). The learn/Alaska networks: Instructional telecommunications in Alaska. In R. M. Walp (Ed.), Telecommunication in Alaska (pp. 69–73). Honolulu, HI: Pacific Telecommunications Council.

Descy, D. E. (1991). The KIDS network: Two-way interactive television in Minnesota. Tech Trends, 36(1), 44–48.

Diamond, R. M. (1989). Systems approaches to instructional development. In M. Eraut (Ed.), International Encyclopedia of Educational Technology (pp. 328–333). New York: Pergamon Press.

Dille, B., & Mezack, M. (1991). Identifying predictors of high risk among community college telecourse students. The American Journal of Distance Education, 5(1), 24–35.

Ding, X. (1994). China's higher distance education–Its four systems and their structural characteristics at three levels. Distance Education, 15(2), 327–346.

Ding, X. (1995). From Fordism to new-Fordism: industrialisation theory and distance education–a Chinese perspective. Distance Education, 16(2), 217–240.

Dodd, J. (1981). In A. Kaye and G. Rumble (Eds.), Distance teaching for higher and adult education. London: Croom Helm.

Doerfort, D. L. & Miller, W. W. (1995). Using diaries assess the learning needs and course performance of students served by three instructional delivery means. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 117–126). Ames, Iowa: Teacher Education Alliance

Drea, J. T., & Armistead, L. P. (1988). Serving distant learners through instructional technologies. (ERIC Document Reproduction Service No. ED 289 575)

Duning, B. S. (1987). Independent study in higher education: A captive of legendary resilience? The American Journal of Distance Education, 1(1), 37–46.

Duning, B. S., Van Kekerix, M. J., & Zaborowski, L. M. (1993). Reaching learners through telecommunications: Management and leadership strategies for higher education. San Francisco: Jossey-Bass.

Dunnett, C. (1990a). The economics and use of video in education, particularly at a distance. Educational Media International, 27, 171.

Dunnett, C. (1990b). Open–access media. Educational Media International, 27, 197–207.

Dyck, N. J., & Thurston, L. P. (1987, November). A promising teacher training model for rural settings. Paper presented at the Council for Exceptional Children's Topical Conference on the Future of Special Education, Orlando, FL.

Earl, A. W. (1989). Design of a telecourse: From registration to final exam. Paper presented at the Annual Conference on Emerging Technologies in Education and Training, Augusta, ME. (ERIC Document Reproduction Service No. ED 317 182)

Ediger, M. (1989). Distance learning and the curriculum. (ERIC Document Reproduction Service No. ED 318 432)

Edwards, R. (1995). Different discourses, discourses of difference: Globalisation, distance education, and open learning. Distance Education, 16(2), 241–255.

Egan, M. W., Welch, M., Page, B., & Sebastian, J. (1992). Learners' perceptions of instructional delivery systems: Conventional and television. The American Journal of Distance Education, 6(2), 47–55.

Eicher, J. C. (1987). Costs of the new information technologies in education: Characteristics and problems of measurement. Paris, France: United Nations Educational, Scientific and Cultural Organization. (ERIC Document Reproduction Service No. ED 315 050)

Eiserman, W. D., & Williams, D. D. (1987). Statewide evaluation report on productivity project studies related to improved use of technology to extend educational programs (Sub-Report Two: Distance Education in Elementary and Secondary Schools. A Review of Literature). Logan, UT: Wasatch Institute for Research and Evaluation. (ERIC Document Reproduction Service No. ED 291 350)

Elton, M., and Carey, J. (1977). Implementing interactive telecommunication services: Final report on problems which arise during implementation of field trials and demonstration projects. (ERIC Document Reproduction Service No. ED 207 524)

Eraut, M. R. (1989). Conceptual frameworks and historical development. In M. Eraut (Ed.), International Encyclopedia of Educational Technology (pp. 11–21). New York: Pergamon Press.

Evans, T. (1989). Taking place: The social construction of place, time and space, and the (re)making of distances in distance education. Distance Education, 10(2), 170–183.

Evans, T. (1995). Globalisation, post-Fordism and open and distance education. Distance Education, 16(2), 256–269.

Everett, C. (1989). Distance education and its applications for vocational education: A VES monograph. Bloomington, IN: Indiana University. (ERIC Document Reproduction Service No. ED 324 522)

Fast, M. (1995, April). Interaction in technology: Mediated, multisite, foreign language instruction. Paper presented at theAnnual Meeting of the American Educational Research Association, San Francisco, CA.

Feasley, C. E. (1983). Serving learners at a distance: A guide to program practices. Washington, DC: ERIC Clearinghouse on Higher Education.

Feder, E., & Berman, W. (1989). Reaching out in Fort Collins. Technological Horizons in Education, 16(6), 72–73.

Fields, B. A. (1989). Minimal intervention in in-service teacher education: A strategy for training teachers at a distance. Distance Education, 10(2), 184–195.

Fink, E.J., & Tsujimura, N. (1991, February). An interactive, televised Japanese language class: Lessons learned by professors and director. Educational Technology, 31, 46–50.

Fjortoft, N. F. (1995). Predicting persistence in distance learning programs. (ERIC Document Reproduction Service No. ED 387 620)

Foell, N. A. (1990). Electronic distance learning and teacher education: It can work. Journal of Industrial Teacher Education, 27, 75–78.

Fredin, E. S. (1980). The dynamics of communication and information on groups: The impact of two-way cable television in organizations. Dissertation Abstracts International, 41(09-A), 3770.

Fredin, E. S. (1983). The context of communication: Interactive telecommunications, interpersonal communication, and their effect on ideas. Communication Research: An International Quarterly, 10(4), 553–581.

Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. The American Journal of Distance Education, 7 (3), 8–21.

Garland, M. (1993a). Ethnography penetrates the "I didn't have time" rationale to elucidate higher order reasons for distance education withdrawal. Research in Distance Education, 5(1&2), 6–10.

Garland, M. R. (1993b). Student perceptions of the situational, institutional, dispositional, and epistemoloical barriers to persistence. Distance Education, 14 (2), 181–198.

Garrison, D. R. (1989). Understanding distance education. A framework for the future. London: Routledge.

Garrison, D. R. (1990). An analysis and evaluation of audio teleconferencing to facilitate education at a distance. The American Journal of Distance Education, 4(3), 13–24.

Garrison, D. R., & Shale, D. (1987). Mapping the boundaries of distance education: Problems in defining the field. The American Journal of Distance Education, 1(1), 7–17.

George, P. (1989). Interactive television: A new technology for teaching and learning. CALICO Journal, 6(3), 43–46.

Graf, D. (1993). Teleteaching: Distance education planning, techniques, & tips. Ames, IA: Media Resources Center, Iowa State University.

Graff, K., & Holmberg, B. (Eds.). (1988). International study on distance education: A project report. Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 300 656)

Graham, S. W., & Wedman, J. F. (1989). Enhancing the appeal of teletraining. Journal of Instructional Psychology, 16(4), 183–191.

Gunther, R. J. (1989). The interactive television classroom. Educational Facility Planner, 27(5), 20.

Hagon, R. (1986). Serving the underserved: Two-way cable television links rural schools. Tech Trends, 31(1), 18–21.

Hall, J. W. (1990). Distance education: Reaching out to millions. Change, 22(4), 48.

Handler, M. (1988). Meeting an author online. The Computing Teacher, 16(2), 17–19.

Hanson, G. (1990). Distance education and educational needs: A model for assessment. Media and Methods, 27(1), 17–18.

Hanson, G. D. (1987). Expanding course offerings via interactive television. Rural Educator, 8(3), 5–8.

Harbison, E. S. (1989). Increasing use of instructional television programming. Media and Methods, 25(5), 30–34.

Hart, R. (1985). Presenting lifelong learning opportunities via instructional television fixed service channel: A national resource. (ERIC Document Reproduction Service No. ED 263 305)

Hart, R. A. (1986). Sunrise to sunset: Lifelong learning via microwave networks: From a national heritage. (ERIC Document Reproduction Service No. ED 287 049)

Harte, A. J. (1990). Small secondary schools: Making better use of distance education. Rural Educator, 12(1), 10–12.

BEST COPY AVAILABLE

Haughey, M. L., & Murphy, P. J. (1984). Using high tech: Continuing professional education by an interactive satellite system. Improving College and University Teaching, 32(4), 191–194.

Hayes, E. (1990). Adult education: Context and challenge for distance education. The American Journal of Distance Education, 4(1), 25–38.

Heath, P. R., Drea, J. T., & Armistead, L. P. (1987). The educational common market: A decade of growth through cooperation. Catalyst, 17(4), 8–12.

Hedberg, J. G., & McNamara, S. E. (1989). The human-technology interface: Designing for open and distance learning. Educational Media International, 26(2), 73–81.

Hezel, R. T. (1991). Statewide planning for telecommunications in education: Some trends and issues. Tech Trends, 36(5), 17–20.

Hickey, T. (1991). Distance learning and second language acquisition: The role of input and interaction. Penn Working Papers in Educational Linguistics, 7(1). (ERIC Document Reproduction Service No. ED 331 305)

Hill, I. (1984). Interactive TV 23: Promising practice. Action in Teacher Education, 5(4), 49–52.

Hobbs, V. M. (1990). Distance learning in North Dakota: Across-technology study of the schools, administrators, instructors and students. Denver CO: Mid-Continent Regional Educational Laboratory. (ERIC Document Reproduction Service No. ED 328 225)

Hodgson, V. (1989). Open learning and technology-based learning materials. Distance Education, 10(1), 119–126.

Holmberg, B. (1974). On the path towards a theory of distance education. Distance education: A short handbook. Sweden: Hermods.

Holmberg, B. (1977). Distance education: A survey and bibliography. London: Kogan Page.

Holmberg, B. (1981). Status and trends of distance education. London: Kogan Page.

Holmberg, B. (1982). Recent research into distance education (Volume 1 and Volume 2). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 235 781)

Holmberg, B. (1985). The feasibility of a theory of teaching for distance education and a proposed theory (ZIFF Papiere 60). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 290 013)

Holmberg, B. (1986). Growth and structure of distance education. London: Croom Helm.

Holmberg, B. (1987). The development of distance education research. The American Journal of Distance Education, 1(3), 16–23.

Holmberg, B. (1988). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 114–122). New York: Routledge.

Holmberg, B. (1989). The concept, basic character and development potentials of distance education. Distance Education, 10(1), 127–135.

Holmberg, B. (1990a). A bibliography of writings on distance education. Hagen, West Germany: FernUniversität. (ERIC Document Reproduction Service No. ED 326 738)

Holmberg, B. (1990b). Perspectives of research on distance education, 2nd updated and expanded edition. Hagen, West Germany: FernUniversität. (ERIC Document Reproduction Service No. ED 325 633)

Holmberg, B. (1995a). The sphere of distance-education theory revisited. (ERIC Document Reproduction Service No. ED 386 578)

Holmberg, B. (1995b). The evolution of the character and practice of distance education. Open Learning, 10(2), 47–53.

Holt, S. L. (1991). Video-delivered K–12 distance learning: A practitioner's view. T.H.E. Journal, 19, 59–63.

Holznagel, D. C., & Olson, T. (1990). A study of distance education policies in state education agencies. Portland, OR: Northwest Regional Educational Laboratory. (ERIC Document Reproduction Service No. ED 319 402)

Hopkins, G., Jr. (1983). The new ITFS system in South Carolina. EITV, 15(7), 50–52.

Houtek, E. (1990). Managing distance education courses: The guide series in continuing education.

Champaign, IL: Office of Continuing Education and Public Services.

Hudson, H. E., & Boyd, C. H. (1984). Distance learning: A review for educators. Austin, TX: Southwest Educational Development Lab. (ERIC Document Reproduction Service No. ED 246 872)

Hudspeth, D., & Brey, R. (1986). Telecommunications: Principles and applications. New York: Praeger Publishers.

Hughes, A. L. (1986). The crisis of distance learning–A dangerous opportunity. (ERIC Document Reproduction Service No. ED 304 128)

Inqual, S. (1990). Refugees and distance education. Convergence, 23(3), 37–48.

Iowa Department of Education. (May 4, 1990). Iowa Code subsection 256.7(9). Ch. 15, "Use of Telecommunications for Instruction by Schools," 281-15.5(256).

Iowa Distance Education Alliance (IDEA). (1992, July). Partnerships for interactive learning through telecommunications in Iowa's secondary schools (84,203B Star Schools-Special Statewide Network). Johnston, IA: Iowa Public Television.

Jaschik, S. (1985, November 6). Uses of telecommunications for instruction across state lines attracting official notice. Chronicle of Higher Education, 31, p. 13.

Jefferson, F. E., & Moore, O. K. (1990). Distance education: A review of progress and prospects. Educational Technology, 30(9), 7–12.

Jegede, O. J., & Kirkwood, J. (1994). Students' anxiety in learning through distance education. The American Journal of Distance Education, 15 (2), 279–290.

Jinks, J., & Lord, R. (1990). The better elementary science teaching project: Overcoming the rural teacher's professional and academic isolation. School Science and Mathematics, 90(2), 125–133.

Johnson, A. (1988). Attitudes of high school students in small rural schools toward satellite instruction. Unpublished master's thesis, Iowa State University, Ames, IA.

Johnson, J. K. (1988). Attitudes of high school students in small rural schools toward interactive satellite instruction. Unpublished master's thesis, Iowa State University, Ames.

Johnson, L. F. (1989). Small schools and distance education: Not a panacea but a ray of hope. Thrust, 19, 26–28.

Jones, J. I., Simonson, M. R., Kemis, M., & Sorensen, C. (1992). Distance education: A cost analysis. (Available from the Research Institute for Studies in Education, Iowa State University, Ames, IA).

Jordahl, G. (1989). Communications satellites: A rural response to the tyranny of distance. Educational Technology, 29(2), 34–38.

Jordahl, G. (1991, February). Breaking down classroom walls: Distance learning comes of age. Technology and Learning, 11, 72.

Julian, A. A. (1982). Utilizing telecommuncations for non-traditional instruction in the North Carolina community college system. (ERIC Document Reproduction Service No. ED 224 957)

Jurasek, K. A. (1993). Distance education via compressed video: An evaluation. Unpublished master's thesis, Iowa State University, Ames, Iowa.

Kaye, A. R. (1987). Computer conferencing and electronic mail. Bucks, England: Institute of Educational Technology, Open University, Walton Bletchley. (ERIC Document Reproduction Service No. ED 329 209)

Kaye, A. R. (1990). Computer conferencing and mass distance education: CITE report no. 98. Bucks, England: Institute of Educational Technology, Open University, Walton Bletchley (ERIC Document Reproduction Service No. ED 328 221)

Kaye, A., & Rumble, G. (1981). Distance teaching for higher and adult education. London: Croom Helm.

Keegan, D. (1980). On the nature of distance education (ZIFF Papiere 33). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 311 890)

Keegan, D. (1986). The foundations of distance education. London: Croom Helm.

Keegan, D. (1988a). On defining distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 63–65). New York: Routledge.

Keegan, D. (1988b). Theories of distance education. Introduction. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 63–65). New York: Routledge.

Keegan, D. (1994). Distance training in the European union (ZIFF Papiere). Hagen, Germany: Institute for Research into Distance Education, Fern Universitat. (ERIC Document Reproduction Service No. ED 381 684)

Keegan, D. (1995). Distance education technology for the new millennium: Compressed video teaching. (ERIC Document Reproduction Service No. ED 389 931).

Kember, D. (1989). A longitudinal-process model of drop-out from distance education. Journal of Higher Education, 60(3), 278–299.

Kested, W. B. (1985). Two way instructional television. Phi Delta Kappan, 67(12), 315–316.

Kitchen, K., & Fredericksen, J. (1987). A business/education telecommunications partnership: A Minnesota case study. Tech Trends, 32(9), 24–25.

Kitchen, K., & Kitchen, W. (1988). Two-way interactive television for distance learning: A primer. Alexandria, VA: National School Boards Association. (ERIC Document Reproduction Service No. ED 312 094)

Kitchen, K., & Russell, J. T. (1987). Educational telecommunications: An overview of Minnesota's state-funded projects. Technological Horizons in Education, 14(8), 55–56.

Kitchen, W. (1987). Education and telecommunications: Partners in progress (Testimony to the Senate Committee on Labor and Human Services, March 11, 1987). (ERIC Document Reproduction Service No. ED 282 551)

Kober, N. (1990). Think rural means isolated? School Administrator, 47(10), 16–18.

Kooi, J. B. (1989). Alternative education/alternative revenue: Media technology begets revenue. New Directions for Community Colleges, 68(Winter), 45–49.

Koontz, F. R. B. (1989). Critical barriers to the adoption of instructional television in higher education. Educational Technology, 29(4), 45–48.

Kruh, J., & Murphy, K. L. (1990). Interaction in teleconferencing: The key to quality instruction. Paper presented at the Annual Rural and Small Schools Conference, Manhattan, KS. (ERIC Document Reproduction Service No. ED 329 418)

Kwiatek, K. K. (1982). New ideas in the workplace: Learning from interactive television. Journal of Educational Technology Systems, 11(2), 117–129.

Lacina, L. J., & Book, C. L. (1991). Successful teaching on television. College Teaching, 39, 156–159.

Lacy, H., & Wolcott, L. L. (1988). Making effective telecommunications presentations: A handbook and workshop for SETOC instructors and users. Salt Lake City, UT: University of Utah.

Lanier, R. (1986). Interactive telesystem breaks new ground. EITV, 18(6), 35–38.

Laube, M. R. (1992). Academic and social integration variables and secondary student persistence in distance education. Research in Distance Education, 4(1), 2–5.

Lauzon, A. C., & Moore, G. A. B. (1989). A fourth generation distance education system: Integrating computer-assisted learning and computer conferencing. The American Journal of Distance Education, 3(1), 38–49.

Leveille, D. E. (1986). The California and central valley microwave network: Serving adult learners through lifelong learning opportunity. (ERIC Document Reproduction Service No. ED 277 289)

Lewis, R. J. (1982). The role of the correspondence tutor. In J. S. Daniel, M. A. Stroud, & J. R. Thompson (Eds.), Learning at a distance: A world perspective (pp. 135–136). Edmonton: Athabasca University.

Lintz, M. & Tognotti, S. (1996). Distance Education on the WWW. [World Wide Web], Available: http://tecfa.unige.ch/edu-ws94/contrib/peraya.fm.html

Lippke, J. A. (1986). Networking to improve instructional television usage. EITV, 18(2), 20–25.

Lowenstein, R., & Barbee, D. E. (1990). The new technology: Agent of transformation. Washington, DC: Department of Labor. (ERIC Document Reproduction Service No. ED 329 248)

Lundgren, R. W. (1985). Two-way television in rural curriculum development. NASSP Bulletin, 69(November), 15–19.

MacVicar, R. (1988). Opportunities for telecommunication for university outreach in Arizona. (ERIC Document Reproduction Service No. ED 306 789)

Magnus, J. (1996). Distance education in sub-Saharan Africa: The next five years. Innovations in Education and Training International, 33(1), 50–56.

Markowitz, H. (1990). Distance education: Staff handbook. Urbana, IL: Office of Continuing Education and Public Services. (ERIC Document Reproduction Service No. ED 323 334)

Martin, E. D., & Rainey, L. (1993). Student achievement and attitude in a satellite-delivered high school science course. The American Journal of Distance Education, 7(1), 54–61.

Massoumian, B. (1989). Successful teaching via two-way interactive video. Tech Trends, 34(2), 16–19.

May, S. (1993). Collaborative learning: More is not necessarily better. The American Journal of Distance Education, 7(3), 39–50.

McCleary, I. D., & Egan, M. W. (1989). Program design and evaluation: Two-way interactive television. The American Journal of Distance Education, 3(1), 50–60.

McClelland, J. (1987). Use of two-way interactive television in education: Training and development research center project 18. (ERIC Document Reproduction Service No. ED 288 503)

McClelland, J., & Saeed, F. (1986). Adult education and vocational education: Implications for research on distance delivery. St. Paul, MN: Minnesota Research and Development Center for Vocational Education. (ERIC Document Reproduction Service No. ED 276 852)

McCormick, F. C., & McCormick, E. R. (1982a). A project on uses of technology in rural schools. (ERIC Document Reproduction Service No. ED 266 927)

McCormick, F. C., & McCormick, E. R. (1982b). A guide to successful uses of technology in rural schools: A project of uses of technology in rural schools. St. Paul, MN: Educational Operations Concepts, Inc. (ERIC Document Reproduction Service No. ED 262 923)

McGreal, R., & Simand, B. (1992). Problems in introducing distance education into northern Ontario secondary schools. The American Journal of Distance Education, 6(1), 51–78.

McIntosh, D. K. (1984). Interactive distance learning technologies. EITV, 16(8), 47–48.

McNeil, D. R. (1990). Wiring the ivory tower: A round table on technology in higher education. Washington, DC: Academy for Educational Development, Inc. (ERIC Document Reproduction Service No. ED 320 555)

Melton, R. F. (1990). Transforming text for distance learning. British Journal of Educational Technology, 21(3), 83–95.

Milheim, W. D. (1989). Computers and satellites: Effective new technologies for distance education. Journal of Research on Computing in Education, 22(2), 151–159.

Milheim, W. D. (1991). Implementing distance education programs: Suggestions for potential developers. Educational Technology, 31(April), 51–53.

Miller, D. (1991). Trim travel budgets with distance learning. Training and Development, 45(9), 71–74.

Miller, I. (1991). MCET: Creating the infrastructure. The Annals of the American Academy of Political and Social Science, 92–106.

Minnesota Educational Computing Consortium. (1990). Technology as an instructional tool: What we are learning. St. Paul, MN: Minnesota Educational Computing Consortium. (ERIC Document Reproduction Service No. ED 326 207)

Minnesota State Department of Education. (1990). Distance education for all ages in Minnesota: The K–12 systems perspective. (ERIC Document Reproduction Service No. ED 330 319)

Monahan, B. D., & Wimber, C. (1988). Distance learning and public school finance. Educational Technology, 28(July), 40–42.

Monk, D. (1989). Using technology to improve the curriculum of small rural schools. (ERIC Document Reproduction Service No. ED 308 056)

Moore, M. (1973). Toward a theory of independent learning and teaching. Journal of Higher Education, 44(12), 661–679.

Moore, M. (1977). On a theory of independent study (ZIFF Papiere). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 285 571)

Moore, M. (1983). Self-directed learning and distance education (ZIFF Papiere 48). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 257 430)

Moore, M. (1988a). On a theory of independent study. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 68–94). New York: Routledge.

Moore, M. (1988b). Telecommunications, internationalism and distance education. The American Journal of Distance Education, 2(1), 1–7.

Moore, M. (1989). Distance education: A learner's system. Lifelong Learning, 12(June), 8–11.

Moore, M. (1994). Autonomy and interdependence. The American Journal of Distance Education, 8(2), 1–5.

Moore, M. G. (1989). Effects of distance learning: A summary of the literature. Washington DC: Office of Technology Assessment, Congress of the United States.

Moore, M. G. (1995). The 1995 distance education research symposium: A research agenda. The American Journal of Distance Education, 9(2), 1–6.

Moore, M. G., & Thompson, M. M. (1990). The effects of distance learning: A summary of literature: Research monograph number 2. Southeastern Ohio Telecommunications Consortium. (ERIC Document Reproduction Service No. ED 330 321)

Morgan, A. (1984). A report on qualitative methodologies in research in distance education. Distance Education, 5(2), 252–267.

Moss, J. R. (1988). Utah: A case study. Phi Delta Kappan, 70(1), 25–26.

Mouli, C. R., & Ramakrishna, C. P. (1991). Readability of distance education course materials. Research in Distance Education, 3(4), 11–14.

Murgatroyd, S., & Woudstra, A. (1989). Issues in the management of distance education. The American Journal of Distance Education, 3(1), 4–19.

National Education Association. (1988). Educational technology: NEA special committee report. Washington, DC. (ERIC Document Reproduction Service No. ED 317 186)

Nelson, N. (1985). Around the nation with ITFS. Tech Trends, 17(6), 18–24.

Nelson, R. N. (1985). Two-way microwave transmission consolidates, improves education. NASSP Bulletin, 69(November), 38–42.

Nevins, C. L., & Wright, L. J. (1984). Teaching over television: A handbook for ITFS teachers at California State University at Chico. (ERIC Document Reproduction Service No. ED 266 768)

Nevins, C. L., & Wright, L. J. (1987). Teaching over television. Chico, CA: California State University.

Nickerson, G. (1991). Networked resources: The internet. Computers in Libraries, 11(8), 25–29.

Norenberg, C. D., & Lundblad, L. (1987). Distance delivery of vocational education, technology and planning matrixes. (ERIC Document Reproduction Service No. ED 288 084)

Ohler, J. (1989). Distance education and the transformation of schooling: Living and learning in the information age. (ERIC Document Reproduction Service No. ED 324 407)

Olcott, D. J., Jr. (1992). Policy issues in statewide delivery of university programs by telecommunications. The American Journal of Distance Education, 6(1), 14–26.

O'Malley, C. E., & Scanlon, E. (1990). Computer-supported collaborative learning: Problem solving and distance education. Computers and Education, 15(1–3), 127–136.

Ostendorf, V. A. (1991). Shopping for a satellite curriculum. Media & Methods, 27(November/December), 10.

Palchinsky, J. (1982). Cable technology: A challenge for adult educators. (ERIC Document Reproduction Service No. ED 235 302)

Parer, M. (1989). Development, design and distance education. Churchill, Australia: Gippsland Institute. (ERIC Document Reproduction Service No. ED 318 430)

Pate, T. (1985). Interactive television reaches more students. School Administrator, 42(5), 22.

Pease, P. S. (1989). Strategies for implementing distance learning technologies: Why, when and how. School Business Affairs, 55(10), 15–18.

Pease, P. S. (1991). Preparing your facility for distance learning. American School and University, 63(June), 37–38.

Pendleton, J. W. (1989). Closed circuit television as a medium to teach physical geology lecture and laboratory. Journal of College Science Teaching, 18(4), 46–48.

Perraton, H. (1987). Roles of theory and generalisation in the practice of distance education. Three related systems for analyzing distance education (ZIFF Papiere 67). Hagen, West Germany: Zentrales Institute fur Fernstudienforschung Arbeitsbereich, Fern Universitat. (ERIC Document Reproduction Service No. ED 290 015)

Perraton, H. (1988). A theory for distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 34–45). New York: Routledge.

Peters, O. (1988). Distance teaching and industrial production: A comparative interpretation in outline. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 95–113). New York: Routledge.

Peterson, G. A. (1990). Schools and national telecommunications policy. Washington, DC: National Geographic Society. (ERIC Document Reproduction Service No. ED 328 224)

Pichette, M. (1987). Some conditions for the development of interactive tele-learning. Media in Education and Development, 20(3), 100–103.

Pittman, V. V. (1987). The persistence of print: Correspondence study and the new media. The American Journal of Distance Education, 1(1), 31–36.

Pittman, V. V. (1992). Amateurs, tough guys, and a dubious pursuit: Crime and correspondence study in popular culture. The American Journal of Distance Education, 6(1), 40–50.

Preston, N. R. (1990). Distance education at the elementary and secondary level: A select ERIC bibliography. Syracuse, NY: ERIC Clearinghouse on Information Resources. (ERIC Document Reproduction Service No. ED 327 179)

Pugliese, R. R. (1994). Telecourse persistence and psychological variables. The American Journal of Distance Education, 8 (3), 22–39.

Reed, D., & Sork, T. J. (1990). Ethical considerations in distance education. The American Journal of Distance Education, 4(2), 30–43.

Reilly, K. P., & Gulliver, K. M. (1992). Interstate authorization of distance higher education via telecommunication: The developing national consensus in policy and practice. The American Journal of Distance Education, 6(2), 3–16.

Rekkedal, T. (1982). The drop-out problem and what to do about it. In J. S. Daniel, S. A. Stroud, & J. R. Thompson, (Eds.), Learning at a distance: A world perspective. Edmonton: Athabasca University. (ERIC Document Reproduction Service No. ED 222 635)

Renner, W. (1995). Post-Fordist visions and technological solutions: Education technology and the labour process. Distance Education, 16(2), 285–301.

Rezabek, R. J. (1988). Teleteaching handbook: A handbook for teachers using microwave or ITFS interactive instruction. Fort Dodge, IA: Arrowhead AEA.

Riddle, J. F. (1990). Measuring affective change: Students in a distance education class. Paper presented at the annual meeting of the Northern Rocky Mountain Educational Research Association. (ERIC Document Reproduction Service No. ED 325 514)

Riel, M. (1990). Cooperative learning across classrooms in electronic learning circles. Instructional Science, 19(6), 445–466.

Riel, M. & Harasim, L. (1994). Research perspectives on network learning. Machine-Mediated Learning, 4(2–3), 91–113.

Roberts, J. M. E. (1987, April). Instruction from a distance. Paper presented at the annual meeting of the American Educational Research Association, Washington, DC.

Robinson, R. S. (1985). An investigation of technological innovation: Interactive television. (ERIC Document Reproduction Service No. ED 256 331)

Robinson, R. S., & West, P. C. (1986). Interactive cable television: An evaluation study. (ERIC Document Reproduction Service No. ED 267 789)

Rogers, E. M. (1983). Diffusion of innovations. New York: The Free Press.

Romiszowski, A. J. (1990). Computer mediated communication and hypertext: The instructional use of two converging technologies. Interactive Learning International, 6(1), 2–29.

Rose, S. N. (1991). Collegiate-based noncredit courses. In B. B. Watkins & S. J. Wright (Eds.), The foundations of American distance education (pp. 67–92). Dubuque, Iowa: Kendall/Hunt.

Ross, D. (1991). Project management in the development of instructional material for distance education: An Australian overview. Journal of Distance Education, 5(2), 24–30.

Ross, L. R., & Powell, R. (1990). Relationships between gender and success in distance education courses: A preliminary investigation. Research in Distance Education, 2(2), 10–11.

Ross, S. M., Morrison, G. R., Smith, L. J., & Cleveland, E. (1991). An evaluation of alternative distance tutoring models for at-risk elementary school children. (ERIC Document Reproduction Service No. ED 335 009)

Roth, E. B. (1980). Two-way television trains teachers. American Education, 16(9), 20–28.

Rumble, G. (1986). The planning and management of distance education. London: Croom Helm.

Rumble, G. (1989a). On defining distance education. The American Journal of Distance Education, 3(2), 8–21.

Rumble, G. (1989b). The role of distance education in national and international development: An overview. Distance Education, 10(1), 83–107.

Rumble, G. (1992). The management of distance learning systems. Paris: International Institute for Educational Planning, UNESCO.

Rumble, G. (1995a). Labour market theories and distance education I: Industrialisation and distance education. Open Learning, 10(1), 10–21.

Rumble, G. (1995b). Labour market theories and distance education II: How Fordist is distance education? Open Learning, 10(2), 12–28.

Rumble G. (1995c). Labour market theories and distance education III: Post-Fordism the way forward? Open Learning, 10(3).

Russell, T. L. (1989). A study of foreign language instruction via TOTE. Research in Distance Education, 1(2), 2–4.

Russell, T. L. (1993). The "no significant difference" phenomenon as reported in research reports, summaries, and papers. Raleigh, NC: North Carolina State University, Office of Instructional Telecommunications.

Saba, F., & Twitchell, D. (1985). Research in distance education: A system modeling approach. The American Journal of Distance Education, 2(1), pp. 9–24.

Sachs, S. G. (1991). Teaching thinking skills to distant learners. Tech Trends, 36(1), 28–32.

Sachs, S. G. (1993). Supporting compressed video. In B.T. Hakes, S.G. Sachs, C.B. Box, & J. Cochenour (Eds.), Compressed video: Operations and applications (pp. 180–198). USA: The Association for Educational Communication and Technology.

Sachs, S. G., Wilkinson, T., & Murphy, N. (1993). Sharing instructors in Virginia: Improving access to distance education. Tech Trends, 38(1), 22–24.

St. Pierre, S., & Olsen, L. K. (1991). Student perspectives on the effectiveness of correspondence instruction. The American Journal of Distance Education, 5(3), 65–71.

Schamber, L. (1990). Distance education and the changing role of the library media specialist. Syracuse, NY: ERIC Clearinghouse on Information Resources. (ERIC Document Reproduction Service No. ED 327 221)

Schieman, E., & Clark, W. B. (1990). An evaluation of a distance education project designed to provide equity to rural Alberta high schools. Paper presented at the World Congress of the International Council for Distance Education, Caracas, Venezuela. (ERIC Document Reproduction Service No. ED 329 243)

Schmidt, J. B., & Faulkner, S. L. (1989). Staff development through distance education. Journal of Staff Development, 10(4), 2–7.

Schoenfelder, K. R. (1995). Studenti nvolvement in the distance education classroom: Teacher and student perceptions of effective instructional methods. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 79–85). Ames, Iowa: Teacher Education Alliance

Schrum, L. (1991). Teacher education goes online. Educational Leadership, 49(3), 39, 40–41.

Schrum, L. (1992). What is distance education? Principal, 71, 56–57.

Sewart, D. (1988). Distance teaching: A contradiction in terms? In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 46–62). New York: Routledge.

Shale, D. (1988). Toward a reconceptualization of distance education. The American Journal of Distance Education, 2(3), 25–34.

Sharma, M. (1990). Educational broadcasting and distance education as a strategy for revitalizing education of the disadvantaged. Paper presented at the Symposium on Educational Broadcasting for More Effective Distance Education in the 1990s: Strategies and Approaches, Manila, Philippines. (ERIC Document Reproduction Service No. ED 317 837)

Shklanka, O. (1990). Off-campus library services: A literature review. Research in Distance Education, 2(4), 2–11.

Siegmund, D. E., & McFadden, J. (1985). Instructional telecommunications consortium: Linking smaller schools for a more effective curriculum. NASSP Bulletin, 69(11), 35–38.

Simonson, M. R., Johnson, J., & Neuberger, J. (1989). Satellite communications and high school education: Perceptions of students, teachers and administrators. (ERIC Document Reproduction Service No. ED 308 841)

Simonson, M. (1995a). Distance education revisited: An introduction to the issue. Tech Trends, 40(3), 2.

Simonson, M. (1995b). Does anyone really Want to learn at a distance? Tech Trends, 40(3), 12.

Simonson, M. (1995c). More than fiber: Distance education in Iowa. Tech Trends, 40(3), 13–15.

Simonson, M. (1995d). Overview of the Teacher Education Alliance, Iowa Distance Education Alliance research plan. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Ed.), Encyclopedia of Distance Education Research in Iowa (pp. 3–6). Ames, Iowa: Teacher Education Alliance.

Simonson, M. (1996). Distance education: Does anyone really want to learn at a distance? Manuscript submitted for publication.

Simonson, M. & Schlosser, C. (1995). More than fiber: Distance education in Iowa. Tech Trends, 40(3), 13–15.

Smith, W. (1991). The leadership challenge in continuing education and extension. Educational Technology, 31(November), 14–16.

Snowden, B. L., & Daniel, J. S. (1988). The economics and management of small post-secondary distance education systems. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), Distance education: International perspectives (pp. 398–424). New York: Routledge.

Solomon, G. (1991). Distance learning: Program at Upson High School, Thomaston, Georgia. Electronic Learning, 10, 12–13.

Sorensen, C. K. (1995). Attitudes of community college students toward interactive television instruction. In C. Sorensen, C. Schlosser, M. Anderson, & M. Simonson (Eds.), Encyclopedia of Distance Education Research in Iowa (pp. 131–148). Ames, Iowa: Teacher Education Alliance.

Sorensen, C., Maushak, N., & Lozada, M. (1996). Iowa distance education alliance preliminary evaluation report. Ames: Iowa State University, Research Institute for Studies in Education.

Souder, W. E. (1993). The effectiveness of traditional vs. satellite delivery in three management of technology master's degree programs. The American Journal of Distance Education, 7(1), 37–53.

Sparkes, J. (1983). The problem of creating a discipline of distance education. Distance Education, 4(2), 179–186.

Sparkes, J. (1988). On choosing teaching methods to match educational aims. In D. Sewart, D. Keegan, B. Holmberg (Eds.), Distance education: International perspectives (pp. 251–266). New York: Routledge.

Spigler, J. B. (1991). Going the distance with distance learning. American School and University, 63, 32.

Stell, P. F. (1988). Telecommunications and distance learning. (ERIC Document Reproduction Service No. ED 299 961)

Stetten, K. J. (1971). Interactive television software for cable television application. (ERIC Document Reproduction Service No. ED 056 522)

Stern, C. M. (1986). Teaching the distance learner using new technology. Journal of Educational Technology Systems, 15(4), 407–418.

Stone, T. E. (1992). A new look at the role of locus of control in completion rates in distance education. Research in Distance Education, 4(2), 6–9.

Television teaching: A handbook for teaching via instructional television fixed service. (1986). Lincoln, NE: University of Nebraska at Lincoln.

Thach, L. & Murphy, L. (1994). Collaboration in distance education: From local to international perspectives. The American Journal of Distance Education, 8(3), 5–21.

Tight, M. (1988). Open learning and continuing education. New Directions for Continuing Education, 40, 75–83.

Tompkins, L. S. (1993) A new light on distance learning–fiber optics. Journal of Educational Technology Systems, 21(3), 265–275.

Tuckey, C. J. (1993). Computer conferencing and the electronic white board in the United Kingdom: A comparative analysis. The American Journal of Distance Education, 7 (2), 58–72.

Two-way TV enriches curricula in seven districts. School Tech News-SASSP Edition, 3(1), 3.

Tykwinski, J. R., & Poulin, R. C. (1991). North Dakota interactive video network: A practical guide to teleconferencing and distance education. Bismarck: North Dakota University System.

Upitis, R. (1990). Real and contrived uses of electronic mail in elementary school. Computers and Education, 23(2), 129–133.

U. S. Congress, Office of Technology Assessment. (1988). Power on! New tools for teaching and learning. Washington, DC: U. S. Government Printing Office.

U. S. Congress, Office of Technology Assessment. (1989). Linking for learning: A new course for education (OTA-SET-430). Washington, DC: U. S. Government Printing Office.

U. S. Department of Education. (1995). The star schools program. (Available from Star Schools, U. S. Department of Education, 555 new Jersey Avenue NW, Washington, DC 20208-5644)

US Department of Education (1984). Review of the state-of-the-art of educational technologies implemented programs serving LEP [Limited English Proficient] students funded by DOE: Final report. (ERIC Document Reproduction Service No. ED 255 076)

Verduin, J.R., & Clark, T. A. (1991). Distance education: The foundations of effective practice. San Francisco: Jossey-Bass.

Von Prümmer, C. (1990). Study motivation of distance students: A report on some results from a survey done at the FernUniversität in 1987/88. Research in Distance Education, 2(2), 2–6.

Wagner, Ellen D. (1990). Looking at distance education through an educational technologist's eyes. The American Journal of Distance Education, 4(1), 53–68.

Wall, M. (1985). Informational technologies: Alternative delivery systems for rural schools. (ERIC Document Reproduction Service No. ED 270 253)

Waltman, G. H. (1990). New options in continuing education: Professional development for rural social workers. Human Services in the Rural Environment, 13(3), 16–20.

Watkins, B. L. (1991). A quite radical idea: The invention and elaboration of collegiate correspondence study. In B. L. Watkins & S. J. Wright (Eds.), TheFoundations of American Distance Education (pp. 1–35). Dubuque, Iowa: Kendall/Hunt.

Warriner-Burke, H.P. (1990). Distance-learning: What we don't know can hurt us. Foreign Language Annals, 23(April), 129–133.

Wedemeyer, C. A. (1981). Learning at the back door: Reflections on nontraditional learning in the lifespan. Madison: University of Wisconsin Press.

Wedemeyer, D. J., & Lofstrom, M. D. (Eds.). (1990). Proceedings of the Annual Conference of the Pacific Telecommunications Council. Honolulu, HI: Pacific Telecommunications Council. (ERIC Document Reproduction Service No. ED 320 566)

West, P. C. (1980). A survey and report of interest in and availability of systems for the delivery of instruction by remote methods. (ERIC Document Reproduction Service No. ED 192 695)

Whittington, N. (1987). Is instructional television educationally effective? A research review. The American Journal of Distance Education, 1(1), 47–57.

Wilkes, C. W., & Burnham, B. R. (1991). Adult learner motivations and electronic distance education. The American Journal of Distance Education, 5(1), 43–50.

Wilkinson, T. W., & Sherman, T. M. (1990). Perceptions and actions of distance educators on academic procrastination. The American Journal of Distance Education, 4(3), 47–56.

Wilkinson, T. W., & Sherman, T. M. (1991). Telecommunications-based distance education: Who's doing what? Educational Technology, 31(November), 54–59.

Willis, B. (1989). Distance education and academic policy: Making it all fit. Tech Trends, 34(3), 33–34.

Wilson, B. (1990). Students' assessment of distance learning. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, New Orleans, Louisiana. (ERIC Document Reproduction Service No. ED 326 558)

Withrow, F. (1990). Star schools distance learning: The promise. Technological Horizons in Education Journal, 17(9), 62–64.

Wolfe, B. (1985). Cable TV delivers: Result is flexibility for Wichita schools. Tech Trends, 30(4), 20–22.

Young, J.R. (1995). Classes on the Web. Chronicle of Higher Education, November 3, 1995, pp. A27, A32–A33.

Zettersten, A. (1986). New technologies in language learning. New York: Pergamon Press.

Zhang, S., & Fulford, C. P. (1994). Are interaction time and psychological interactivity the same thing in the distance learning television classroom? Education Technology, 34(6), 58–64.

Zvacek, S. M. (1991). Effective affective design for distance education. Tech Trends, 36(1), 40–43.